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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXXVI

I. SOME NOTES ON THE BOTANICAL RELATION BETWEEN NORTH AMERICA AND EASTERN ASIA

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ON making a critical comparison between North American plants and eastern Asiatic ones, I recognized that the plants on both continents are often closely related, as many authors have already pointed out. Here I want to explain some cases in which several questions have until now remained unsettled.

My study is being carried on in the Gray Herbarium under the supervision of Prof. Fernald to whom I wish to express my heartiest gratitude for his very kind and helpful advice.

1. RANUNCULUS GMELINI AND R. PURSHII.—The relation between the two was discussed in detail by Litvinow in Sched. Fl. Ross. in 1922, but more recent authors have often disagreed with his opinion. Hultén stated in the note under *R. Gmelini* in his Fl. Kamt. II that the closely related *R. Purshii* Hooker, extending throughout N. America, is probably to be regarded as a separate species, although he referred Alaskan material to *R. Gmelini*, while Komarov adopted the name *R. Purshii* for his Kamchatkan material. Ovczinnikov as well as American authors have treated all Asiatic material as *R. Gmelini* and all American as *R. Purshii*. To settle the question, I compared a large number of American specimens with those from Jakutsk, Transbaicalia, Kamchatka and Saghalien, but I did not find any constant characters by which these could be separated into two distinct species.

I found that some American specimens, for example those from Minnesota and Michigan, agree exactly with the Asiatic plant. So I think that both plants, American and Asiatic, can not be distinguished as independent species. The American ones, however, have generally more robust growth and thicker stems, larger leaves with broader lobes, larger flowers, broader petals and a larger fruit-cluster, with a globular receptacle, and they may be called *R. Gmelini* var. *Purshii* (Hook.). An emersed form which is strongly hairy and is not known from Eastern Asia is var. *limosus* (Nuttall), and another emersed form endemic in N. America is var. *prolificus* (Fernald).

Ranunculus Gmelini DC., Syst. Veg. I, p. 303 (1818); Schlechtendal, Animadv. Ranuncul. Candol. II. p. 35 (1820); DC., Prodr. I, p. 35 (1824); Litvinov in Sched. Herb. Fl. Ross. VIII, p. 53 (1922); Hultén, Fl. Kamt. II, p. 125 (1928); Ovczinnikov in Komarov. Fl. URSS. VII, p. 354 (1937).—*Ranunculus foliis duplicato trifidis*, etc. J. Gmelin, Fl. Sibir. VI, p. 203, t. 83a, fig. B (1769). *R. pusillus* (non Poiret 1804) Lebebour in Mém. Acad. Imp. Sci. St.-Pétersb. V, p. 546 (1815). *R. Langsdorfi* DC., Prodr. I, p. 34 (1824). *R. sibiricus* Sprengel, Syst. II, p. 652 (1825). *R. Purshii* (non Richardson) Koidzumi, Fl. Saghal. Nakahara p. 65 (1910); Komarov, Fl. Penin. Kamt. II, p. 137 (1929). *R. multifidus* (non Pursh) Nakai in Bot. Mag. Tokyo XXI, p. 126 (1907). *R. Fauriei* Léveillé in Fedde, Rep. VII, p. 101 (1909). *R. radicans* (C. A. Meyer) Miyabe et Miyake, Fl. Saghal. p. 13 (1915); Kudo, Rep. Veg. N. Saghal. p. 136 (1924).

Nom. Jap. Karakusa-kinpôge.

Var. **Purshii** (Richardson), comb. nov. *R. Purshii* Richardson in Franklin, 1st. Journ. App. ed. I, p. 741 (repr. p. 13) (1823) and App. ed. 2, p. 751 (repr. p. 23) (1823); Hooker, Fl. Bor.-Amer. I, p. 15, t. 7. B (1833); Torrey et Gray, Fl. N. Amer. I, p. 19 (1838); A. Gray, Synop. Fl. N. Amer. I, p. 24 (1895); Fernald in Rhodora XXXVIII, p. 173 (1936). *R. yukonensis* Britton in Bull. New York. Bot. Gard. II, p. 169 (1901).

Var. **limosus** (Nuttall), comb. nov. *R. limosus* Nuttall in Torrey et Gray, Fl. N. Amer. I, p. 20 (1838). *R. multifidus* var. *limosus* (Nuttall) Lawson, Rev. Canad. Ranuncul. p. 47 (1884).

Var. **prolificus** (Fernald), comb. nov. *R. multifidus* var. *terrestris* Gray, Man. ed. 5, p. 41 (1867). *R. Purshii* var. *prolificus* Fernald in Rhodora XIX, p. 135 (1917).

2. Circaea quadrisulcata (Maximowicz) Franchet et Savatier, Enum. Pl. Jap. I-1, p. 169 (1874) quoad syn. tantum, excl. specim. et icon.—*C. lutetiana* (non L.) auct. Asia-orient. *C. lutetiana* L. f. *quadrisulcata* Maximowicz, Prim. Fl. Amur. p. 106 in textu (1859). *C. lutetiana* L. var. *quadrisulcata* Maximowicz ex Ascherson et Magnus in Bot. Zeit. XXVIII, p. 783 (1870). *C. lutetiana* subsp. *quadrisulcata* Maximowicz, l. c. p. 787 (1870). *C. mollis* Sieb. et Zucc. var. *Maxi-*

mowiczii Léveillé in Bull. Geogr. Bot. XXI, p. 223 (1912). *C. Maximowiczii* (Lév.) Hara in Journ. Jap. Bot. X, p. 598, f. 13 (1934).—Bracteæ inconspicuæ punctatæ. Sepala vulgo fusco-rubra glanduloso-pilosa. Petala vulgo rosea.

var. **canadensis** (L.), comb. nov. *Circaea lutetiana* (non L.) auct. Amer. *C. lutetiana* β. *canadensis* Linnaeus, Sp. Pl. ed. 1, I, p. 9 (1753). *C. latifolia* Hill, Brit. Herb. p. 138 (1756) nomen illegitimum; Fernald in Rhodora XVII, p. 222 (1915); l. c. XIX, p. 87 (1917).—Bracteæ minutæ saepe setaceæ. Sepala vulgo viridia parce glanduloso-pilosa vel glabrescentia. Petala vulgo alba.

3. Galium trifidum.—In Europe, *Galium trifidum* L. is represented by a single form, but in North America and eastern Asia it differentiates into several forms. In 1897, Wiegand described two varieties from western North America, var. *subbiflorum* and var. *pacificum*, the former as having larger narrow leaves and sometimes stout nearly glabrous and rarely 2- or 3-flowered pedicels, and the latter as having larger and broader leaves, and capillary, scabrous, solitary and arcuate pedicels. The differences between the two varieties are, however, rather mechanical, and we sometimes meet with such a specimen as we can not decide to which variety it should be referred. Even Wiegand himself seems not to be sure in separating the two varieties. In the note of the original description of var. *pacificum*, he added that some Washington specimens had nearly glabrous pedicels, and in Rhodora XII, p. 229, that var. *subbiflorum* had often very slightly prickly peduncles. Besides that, the specimen from California (*Parish* no. 1505, 1882) which was cited in the original description of var. *subbiflorum* was later identified as var. *pacificum* by Wiegand himself. On examining the specimens identified by Wiegand, I found a form with narrow leaves or with short 3-rayed peduncles in his var. *pacificum*, and a form with broad leaves in his var. *subbiflorum*. Hultén recently reported from western North America subsp. *columbianum* (Rydberg) which was said to differ from var. *pacificum* by having 5 or 6 leaves in the upper whorls and 2- or 3-flowered pedicels, but those differences are also artificial and the authentic specimens of var. *pacificum* sometimes show the same characters. Thus the three plants from western North America above mentioned should be united under the name of var. *pacificum*, I think, and this variety should be separated from typical *G. trifidum* by a little more robust habit, and by having pedicels glabrous or slightly scabrous, sometimes shorter and 2- or 3-flowered, and larger leaves which have a tendency to number 5 in a whorl. It is distributed

widely from North America to eastern Asia, and var. *brevipeduncula-tum* Regel (1861) from Ussuri may be identical with it, although its brief description is not enough to settle the question. Another trouble is that var. *subbiflorum* recently has been treated as a variety of *G. tinctorium* L. (*G. Claytoni* Michx.). I have examined a multitude of specimens but have failed to find any constant differences between var. *pacificum* (including var. *subbiflorum*) and *G. tinctorium* as well as those between var. *pacificum* and *G. trifidum*. *G. tinctorium* in this typical form is clearly distinguished from *G. trifidum* by its robust growth, its leaves generally in 5 or 6's, its short pedicels straight and glabrous in 3-rayed bracteate umbels, but both plants are connected through var. *pacificum* by a complete series of intermediate forms. Therefore, judging from the material examined, I conclude that the plants above discussed should belong to a single circumpolar species differentiated into 3 geographical varieties or subspecies, the typical *G. trifidum* in Europe and North America, var. *pacificum* in North America and Eastern Asia, and the other extreme, subsp. *tinctorium* (L.), endemic in eastern N. America. The above synonymy is briefly summarized as follows:

GALIUM TRIFIDUM L. Sp. Pl. ed. 1, I, 105 (1753); Wiegand in Bull. Torrey Bot. Cl. XXIV, 399 (1897).

Var. PACIFICUM Wiegand in Bull. Torrey Bot. Cl. XXIV, 391 & 400 (1897); Hara in Bot. Mag. Tokyo LI, 839 (1937). *G. trifidum* var. *subbiflorum* Wiegand, l. c. 391 & 399 (1897). *G. subbiflorum* (Wiegand) Rydberg in Bull. Torr. Bot. Cl. XXXIII, 152 (1906). *G. Claytoni* var. *subbiflorum* (Wiegand) Wiegand in RHODORA XII, 229 (1910). *G. columbianum* Rydberg, Fl. Rocky Mts. 808 & 1066 (1917). *G. tinctorium* var. *subbiflorum* (Wiegand) Fernald in RHODORA XXXIX, 320 (1937). *G. trifidum* subsp. *columbianum* (Rydberg) Hultén, Fl. Aleut. 307 (1937).

Subsp. **tinctorium** (L.), comb. nov. *G. tinctorium* L. Sp. Pl. ed. 1, I, 106 (1753).—Fernald in RHODORA XXXVII, 445, pl. 403 fig 1–2 (1935). *G. Claytoni* Michaux, Fl. Bor.-Amer. I, 78 (1803); Wiegand, l. c. 400 (1897). *G. trifidum* β. *tinctorium* (L.) Torrey et Gray, Fl. N. Amer. II, p. 22 (1841).

4. ERIGERON ACRIS GROUP.—*Erigeron elongatus* Ledebour (1829), which has recently been applied to the plant with glabrescent involucres in N. America, Northern Asia and Northern Europe is not valid, as it has an earlier homonym, i. e. *E. elongatus* Moench (1802).

E. droebachensis was based on the plate 874 of Flora Danica and this binomial was validated for the first time by Retzius in Fl. Scand.

Prodr. ed. 2, p. 194, no. 1010 (1795). It may be identical with the plant in question, but most Scandinavian authors have rejected the name for the reason that they can not judge from its figure and its brief description whether it is the plant in question or is merely a form of *E. acris*, and the exact application of the name is quite doubtful.

The second name given to this group is *E. angulosus* Gaudin Fl. Helv. V, 265 (1829) described from the European Alps. The photograph of the type specimen in Herb. Inst. Bot. Univ. Lausanne in Switzerland is at my disposal through the courtesy of Prof. Maillefer and of Prof. Fernald to whom I express my sincerest thanks. Although *E. angulosus* has always narrow linear leaves, it agrees well with our plant in the hairiness on involucres and peduncles, the shape and size of involucral bracts, the length of pappus, etc. and I can not find any constant characteristics to separate the plants specifically. The common form in Eastern Asia and North America with broader leaves and sparsely hairy stems is without doubt identical with *E. kamtschaticus* DC., and should be considered as a variety of *E. angulosus*. This treatment, however, is only provisional, as the group of *E. acris* needs further critical study. When *E. acris* and *E. angulosus* are compared in their typical forms, they are quite distinct, but puzzling intermediate forms are sometimes found.

ERIGERON ANGULOSUS Gaudin, Fl. Helv. V, p. 265 (1829); Koch, Synop. Fl. Germ. et Helv. ed. 1, p. 354 (1837). *E. droebachensis* b. *angulosus* (Gaudin) Reichenbach, Icon. Fl. Germ. et Helv. XVI, p. 11, t. 916-II (1854). *E. acris* β. *glabratus* Neilreich, Fl. Nied.-Oester. p. 331 (1859). *E. acris* forme I. *E. angulosus* Gaudin ex Rouy et Camus, Fl. Franc. VIII, p. 153 (1903). *Trimorpha angulosa* (Gaudin) Vierhapper in Beih. Bot. Centralbl. XIX-2, p. 423 (1906). *E. acris* subsp. *angulosus* (Gaudin) Vollmann, Fl. Bayern p. 725 (1914); Hegi, Fl. Mitt.-Europ. VI-1, p. 438 (1917).

Var. **kamtschaticus** (DC.), comb. nov. *Erigeron elongatus* Ledebour, Icon. Fl. Alt. I, p. 9, t. 31 (1829), Fl. Alt. IV, p. 91 (1833) and Fl. Ross. II, p. 487 (1845); DC., Prodr. V, p. 291 (1836); Fries, Novit. Fl. Suec. III, p. 108 (1842); Hartman, Handb. Scand. Fl. ed. 4, p. 270 (1843) and ed. 11, p. 9 (1870); Blytt, Norg. Fl. p. 563 (1861); Hultén, Fl. Kamt. IV, p. 160 (1930); Fernald in RHODORA XL, p. 346 (1938); not *E. elongatus* Moench, Method. Pl. Suppl. p. 247 (1802). *E. kamtschaticus* DC., Prodr. V, p. 290 (1836); Ledebour, Fl. Ross. II, p. 488 (1845); Koidzumi in Bot. Mag. Tokyo XXXI, p. 139 (1917); Komarov, Fl. Penin. Kamt. III, p. 126 (1930). *E. acris* var. *kamtschaticus* (DC.) Herder in Bull. Soc. Nat. Moscou XXXVIII-1, p. 392

(1865). *E. acris* ζ. *elongatus* (Ledeb.) Herder, l. c. *E. kamtschaticus* var. *hirsuta* Fr. Schmidt, Reis. Amur. u. Sachal. p. 147 (1868); Koidz. l. c. 140 (1917). *E. acer* var. *manshuricus* Komarov, Fl. Mansh. III, p. 610 (1907). *Trimorpha elongata* (Ledeb.) Vierhapper, l. c. p. 424 (1906); Lindman, Svensk Fanerog. p. 529 (1918). *E. acre* var. *hirsutum* (Fr. Schm.) Miyabe et Miyake, Fl. Saghal. p. 240 (1915); Hara in Bot. Mag. Tokyo LII, p. 70 (1938). *E. acris* (non L.) auct. Amer. et Japon; Kitamura, Comp. Jap. I, 324 (1937). *E. kamtschaticus* var. *manshuricus* Koidz., l. c. 140 (1917).

5. ANAPHALIS MARGARITACEA.—Several forms have been described in this widely distributed species in North America and eastern Asia, but the relation between those forms has not been fully studied as yet. As pointed out by Profs. Fernald and Wiegand,[1] var. *occidentalis* Greene, with broad leaves shining green above, is regarded as the common form in the northern and western part of N. America and eastern Asia. Really the eastern Asiatic form agrees well with the western North American, although specimens from northeastern North America have somewhat larger heads and more obtuse involucral bracts. The oldest name for this variety is var. *intermedia* or *kamtschatica* Herder, which, however, should be considered as the typical form of the Linnean *Gnaphalium margaritaceum*, as Prof. Fernald[2] has recently cleared up the case.

A form with narrow green leaves about 5 mm. broad is called var. *angustior* (Miquel) Nakai in Japan, while it is called var. *revoluta* Suksdorf (= f. *anochlora* Fernald) in North America. Japanese specimens which are not uncommon in the middle part of Honshu have hardly any difference from the isotype of var. *revoluta* which I have examined. And the earliest varietal epithet for this form is *angustior*.

In January 1937, I published var. *intercedens*, which has narrow leaves lanate on both sides and occurs in gravelly places of northern Japan. To my surprise, it agrees well with var. *revoluta* f. *arachnoidea* Fernald which is common in eastern North America and had long been considered as the typical form of *A. margaritacea* (L.).

The above three varieties are often connected by intermediate forms; the distinction between var. *intermedia* and var. *angustior* especially is not clear in Japan. *Gnaphalium margaritaceum* α. *genuinum* or *americanum* Herder is a mixture of more than two varieties.

[1] RHODORA XIII, p. 26 & 27 (1911).
[2] RHODORA XL, p. 218 (1938).

Another form, var. *subalpina* Gray, is at present endemic in North America, and subsp. *japonica* (Schulz.-Bip.) Kitamura and subsp. *yedoensis* (Franch. et Sav.) Kitamura are endemic in Japan.

ANAPHALIS MARGARITACEA (L.) Bentham et Hooker fil., Gen. Pl. II, p. 303 (1873). *Gnaphalium margaritaceum* Linnaeus, Sp. Pl. ed. 1, II, p. 850 (1753).

Var. TYPICA. *Gnaphalium margaritaceum* β. *intermedium* s. *kamtschaticum* Herder in Bull. Soc. Imp. Nat. Moscou XL.-1, p. 415 (1867). *Anaphalis margaritacea* var. *occidentalis* Greene, Fl. Francis. IV, p. 399 (1897). *A. margaritacea* f. *latifolia* Kudo, Fl. Param. p. 165 (1922).

Var. ANGUSTIOR (Miquel) Nakai in Bot. Mag. Tokyo XL, p. 148 (1926). *Antennaria cinnamomea* DC. β. ? *angustior* Miquel, Ann. Mus. Bot. Lugd.-Bat. II, p. 178 (1866). *Anaphalis margaritacea* var. *revoluta* Suksdorf in All. Bot. Zeits. XII, p. 7 (1906). *Anaphalis margaritacea* f. *anochlora* Fernald in RHODORA XXIV, p. 205 (1922). *Anaphalis margaritacea* subsp. *angustior* (Miq.) Kitamura, Comp. Jap. I, p. 243 (Dec. 1937). *Anaphalis margaritacea* subsp. *angustior* (Miq.) Kitamura et Hara in Bot. Mag. Tokyo LII, p. 2 (Jan. 1938).

Var. INTERCEDENS Hara, l. c. p. 3 (Jan. 1938). *Anaphalis margaritacea* (non L.) Fernald et Wiegand in RHODORA XIII, p. 26 (1911). *A. margaritacea* var. *revoluta* f. *arachnoidea* Fernald in RHODORA XL, p. 219 (May 1938).

6. SAGINA MAXIMA.—*Sagina maxima* A. Gray has hitherto been applied to the common species in Japan and China which is characterized by having very minutely echinate seeds, and which is now called *S. japonica* (Sw.) Ohwi.[1] The examination of the type specimen of *S. maxima* preserved in the Gray Herbarium, however, proves that it is nothing but an elongate form of *S. litoralis* Hultén which is not uncommon in the coastal region of east Asia. The type specimen of *S. maxima* was collected by C. Wright at Hakodata in Hokkaido. In general appearance, it resembles *S. japonica;* its stems are rather slender, attaining 20 cm. long; its calyces also sparsely glandular-hairy. But its seeds have somewhat obscure flat rounded tubercles on the surface, and this last character clearly shows that the plant is not identical with *S. japonica.* As pointed out first by Prof. Nakai *S. litoralis* is closely allied to *S. crassicaulis* Watson, described from California, which has quite glabrous pedicels and calyces and nearly

[1] SAGINA JAPONICA (Sw.) Ohwi in Journ. Jap. Bot. XIII, 438 (1937). *S. procumbens* (non L.) Thunberg, Fl. Jap. p. 80 (1784). *Spergula japonica* Sw. ex Steudel, Nom. Bot. ed. 1, 802 (1821). *Spergella japonica* Sw. ex Steudel, l. c. ed. 2, II, 617 (1841). *Sagina sinensis* Hance in Journ. Bot. VI, 46 (1868). *Sagina maxima* (non A. Gray) auct. plur.; Nakai in Bot. Mag. Tokyo XXXVIII, [230] (1924); Steinberg in Fl. URSS. VI, 473, tab. XXV, fig. 8. (1936).

smooth seeds, although both plants, *S. litoralis* and *S. crassicaulis*, are found in northern Japan, in their typical form. I came to the conclusion, considering the occurrence of several intermediate forms, that *S. litoralis* should be regarded as a geographical variety of *S. crassicaulis* and made the combination *S. crassicaulis* var. *littorea* (Makino) for the former in Journal of Japanese Botany XIII, p. 556 (1937). But now, as *S. maxima* A. Gray antedates Watson's name by 24 years, I must change the combination as follows.

SAGINA MAXIMA A. Gray, Bot. Jap. p. 382 (1859) in adnota. *S. Linnaei* Presl var. *maxima* (A. Gray) Maximowicz in Bull. Acad. Imp. Sc. St. Pétersb. XVIII, p. 372 (1873) pro parte; Matsumura, Ind. Pl. Jap. II-2, p. 86 (1912) pro parte. *S. maxima* f. *littorea* Makino in Bot. Mag. Tokyo XXV, p. 156 (1911). *S. litoralis* Hultén, Fl. Kamt. II, p. 78, fig. 8 (1928) and IV, p. 248 (1930); Komarov, Fl. Penin. Kamt. II, p. 102 (1929); Steinberg in Fl. URSS. VI, p. 473, t. XXV, fig. 7 (1936); Hultén, Fl. Aleut. p. 169 (1937). *S. crassicaulis* var. *littorea* (Makino) Hara in Journ. Jap. Bot. XIII, p. 556 (1937).

Var. **crassicaulis** (Watson), comb. nov. *Sagina crassicaulis* Watson in Proc. Amer. Acad. XVIII, p. 191 (1883); Hultén, Fl. Aleut. p. 168 (1937); Hara, l. c. (1937).

II. THE CRUCIFEROUS GENUS PHYSARIA

REED C. ROLLINS[1]

(Plate 556)

THE Cruciferae are highly developed in western North America both as to the number of biological entities present and the extent of their divergence from any single morphological pattern. A number of genera, including *Physaria*, are unique in being wholly confined to this area and in that they are apparently of comparatively recent origin. These features together with the fact that *Physaria* has never been intensively examined make a study of certain aspects of its ecology, cytology, morphology, speciation and the relationships of its species seem highly desirable. With these points in mind, an investigation of the genus was undertaken involving detailed observations in the field and in the laboratory. The results are presented in the paragraphs that follow.

Physaria occurs in the Upper Sonoran, Transition, Montane and lower Canadian life-zones, chiefly on high plateaus and lower moun-

[1] Society of Fellows of Harvard University.

tain elevations, from the great plains to the Cascades and Sierra Nevada and from Canada to Arizona and New Mexico. In general the habitat is of a dry barren sort, where sunlight is intense and competition between plant species and individuals often approaches a minimum, but where survival entails special adaptation. The xeric conditions under which the plants survive is reflected in the abundant, often densely encrusted vestiture found upon them. Though the Cruciferae have long been famous for the lime-preference which its members show, *Physaria*, as is true of several other genera in the family, seems to be somewhat less selective. This is particularly true of certain species. The plants often occupy siliceous soils of a loose nature or are equally at home on heavily lime-impregnated shale outcrops.

The natural relationship between *Physaria* and *Lesquerella* is very marked. These two genera have almost exactly the same floral pattern, habit of growth and vestiture, which is of a distinctive sort. The siliques too are very similar. In fact the two are not easily recognized as distinct genera if only flowering plants are considered. The fruit of *Physaria* is always didymous, markedly constricted at the replum and usually highly inflated, while that of *Lesquerella* is unconstricted at the replum, never didymous and much less inflated. But even in these respects certain species of *Lesquerella*, namely *L. Kingii* and its close relatives, approach the condition found in such species of *Physaria* as *P. Geyeri*. This relationship was pointed out by Payson,[1] but was disregarded or overlooked by O. E. Schulz[2] who recently placed the two genera in widely separated tribes of the family. The cytological evidence also indicates a closer relationship than that attributed to them by Schulz. On the other hand there is no question as to the separateness of these two genera.

Three species of *Physaria* have been investigated cytologically, the chromosome number having been found to be N = 4 in each case (text figs. 1 & 2). These counts, the first for the genus, were made from aceto-carmine smears of developing pollen. Buds from wild plants were killed and fixed in alcohol-acetic in the field at the following localities: *P. acutifolia* Rydb., N = 4, dry hillsides, granitic talus, 5 mi. east of Parlin, Gunnison Co., Colo., May 21, 1938, *Rollins 2088* (G, R); *P. floribunda* Rydb., N = 4, dry rocky hillside, 3 mi. east of

[1] Ann. Mo. Bot. Gard. **8**: 129 (1921).
[2] Natur. Pflanzenfam. **17***b* (1936).

Sapinero, Gunnison Co., Colo., May 23, 1938, *Rollins 2108* (G, R); *P. australis* (Pays.) Rollins, N = 4, limy knoll, 3 mi. west of Fort Bridger, Uinta Co., Wyoming, *Rollins 2229* (G, R). If these results may be taken as indicative, then the basic or fundamental number for *Physaria* must be four.

It has been suggested by Payson (*l. c.*) that *Physaria* was derived from *Lesquerella*. His suggestion was based chiefly on morphological studies, but is equally supported by the present cytological observations on both genera. Chromosome numbers of 2N = 10, 18 and 12 have been reported for *Lesquerella* by Manton.[1] I have found N = 5 for four species, N = 6 for one species and N = 8 for another species

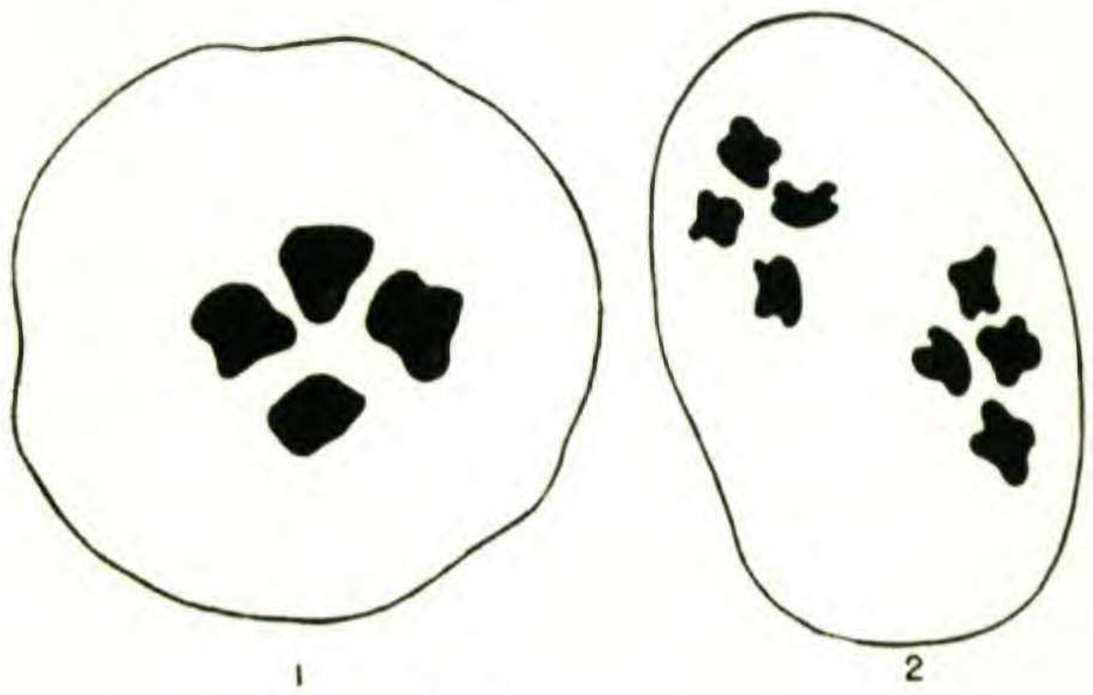


FIG. 1. Chromosomes in a developing pollen grain of PHYSARIA FLORIBUNDA Rydb. *Rollins* no. 2108. × about 1000.
FIG. 2. Chromosomes in a dividing pollen mother cell of P. ACUTIFOLIA Rydb. *Rollins* no. 2088. × about 1000.

of the same genus. N = 5 and 6 coincide with the findings of Manton, but the discovery of N = 8 further indicates a probable aneuploid relationship between species of the genus. A cytological study of *Lesquerella* has not proceeded far enough for the accurate determination of its basic chromosome number, but since N = 5 is lowest and most commonly found, in all probability, it represents one of the fundamental numbers for the genus. If this is true, then the case of *Physaria* and *Lesquerella* may be added as a further example of the aneuploid relationship between genera of the Cruciferae so lucidly described by Manton. In any case it seems probable that the loss of a single chromosome from the compliment of five found in certain members of Eu-Lesquerella has been of major importance in the genesis of *Physaria*.

Several inter-related groups of species are found in *Physaria*, but

[1] Ann. Bot. **46**: 531 (1932).

none are sufficiently distinct and definable to make necessary or desirable a subdivision of the genus. In fact each is connected with another through a continuous chain of intermediate species. Probably the most natural aggregation is that made up of *P. Geyeri*, *P. oregona*, *P. alpestris* and *P. Newberryi*. Of these, the former two species show a closer relationship between one another than with either of the latter two. The following may be noted as characteristics commonly shared by members of this group: shallow apical sinus, ovate to ovate-lanceolate replum with an acute apical angle, valves compressed opposite the replum-axis and the lack of a basal sinus. The ovule-number ranges from 2 to 6 in each loculus of the silique among members of this group. There is apparently a straightforward evolutionary trend expressed among these species which becomes increasingly evident when the structural relationships of the fruits are thoughtfully considered. The most striking changes have apparently accompanied a reduction in the number of ovules. These include a progressive sterilization of ovuliferous tissue along the outer margins of the replum. This tissue when relieved of its ovule-bearing function appears to have been converted into tissue of the style. The result has been a shortening of the replum and an increase in the length of the style. If one attempts to arrange the species of this group in a probable evolutionary sequence, invariably *P. oregona* comes out as the most primitive. From the primitive stock, *P. Geyeri* and *P. alpestris* appear to be direct descendants. The genesis of *P. Newberryi* may be the same, but the relationship here is not quite so evident. *P. Chambersii* seems to be transitionary toward other members of the genus. Its silique has certain features in common with *P. alpestris*, but the replum resembles that of *P. floribunda*.

Another natural grouping includes *P. didymocarpa*, *P. condensata* and *P. australis*. Here as in the above we see a progressive reduction in ovule-number, lengthening of style and shortening of replum which results in a greater constriction between the valves. Several types of divergence from the primitive *P. didymocarpa* are notable. *P. condensata* shows the extreme in reduction of growth-form and must surely be a derived species. Another divergence is found in *P. didymocarpa* var. *lanata* in which the entire body of the plants is invested in the same loose pubescence characteristic of only the silique in the species proper. The number of ovules in each ovary-loculus has been reduced to two and the replum has become exceedingly short and

constricted in *P. australis*. This species appears to be the natural link to the third group of inter-related species to which *P. vitulifera, P. Osterhoutii, P. brassicoides, P. acutifolia, P. floribunda* and *P. Grahamii* belong. These species all possess moderately inflated siliques and the ovule-number is uniformly two for each loculus of the ovary. No very marked evolutionary trends are evident, hence any attempt to arrange the species according to the probable order of their origin would be little short of pure speculation. However, certain of the species are more closely related than others. For example, *P. vitulifera* and *P. Osterhoutii* are obviously closely inter-related as are also *P. floribunda* and *P. acutifolia*.

All the known species of *Physaria* are perennial and possess a relatively large central tap-root. The plants are caespitose, with herbaceous flowering stems arising laterally on an elongated woody, usually simple caudex. The basal leaves are borne along the caudex and subtend the flowering stems. These leaves invariably form a sterile rosette on the terminal portion of the caudex or caudex-branch, imparting a characteristic symmetry to the plants as they are observed in their native habitats. This rosette-habit is found in its extreme form in *P. condensata,* where most of the plant is simply "rosette." The shape, size and degree of toothing of the leaves varies between species, but there is a certain amount of stability on these features within any given entity. There is a tendency for the leaves to be entire, or at most remotely dentate, in most species of the genus. However, certain species have the basal leaves dissected.

The flower-parts are reasonably uniform throughout the genus and offer little of diagnostic value in distinguishing between species. The sepals are recognizable as two pairs, one being broader than the other. They are always pubescent with the same type of indument which is found on the rest of the plant. The petals are glabrous, entire, yellow and nearly spatulate. There is little differentiation between blade and claw, but the two pairs of petals differ in width. Characters of the fruit are highly important in indicating relationships and are extremely useful in the delimitation of natural entities. This point was adequately emphasized by Robinson[1] who said of *Physaria*, "species with excellent characters in the fruit, but otherwise very difficult to distinguish." The siliques are pubescent, didymous, variously shaped and possess a sinus at both base and apex or at apex only. The replum

[1] Syn. Fl. **1**: 121 (1895).

is an important diagnostic character which has previously been almost entirely overlooked. Shape, apical angle and dimensions are all important considerations. The number of ovules in each loculus of the silique is a constant feature of several species. This constancy seems to be correlated with a reduced number. Abortion is so common in *Physaria* that it is the normal condition. Species with four or more ovules in each loculus normally develop two or three seeds and species with two ovules in each loculus usually develop only a single seed. The style is persistent and varies in length, but within limits the style is a useful character for distinguishing certain species.

The seeds are wingless and fairly uniform throughout the genus, differing only in dimensions. Within the seeds, the cotyledons are consistently accumbent. The indument varies only slightly, being always of the many-rayed stellate type. The rays are nearly always forked, but vary in length and the degree to which they are appressed to the plant-surface. In *P. Grahamii* and *P. didymocarpa* var. *lanata* the stellae are sufficiently long and spreading to give a lanate appearance to the plants. Uniform in type, covering the entire mature plants and nearly always giving them a silvery appearance, the vestiture cannot be considered of major importance in specific delimitation as is the case in many genera of the Cruciferae. Plants of *Physaria* have been grown in a greenhouse where observations were made on their ontogenetic development. In a young plant the cotyledons are perfectly glabrous, strikingly in contrast with the first pair of true leaves which are heavily incrusted with stellae. In general habit plants grown under artificial conditions differ in no marked way from those which one observes in nature.

Nuttall is credited with the recognition of *Physaria* as a distinct entity by his having been listed as the author of section *Physaria* of the genus *Vesicaria* by Torrey and Gray.[1] After the publication of a second species in the group by Hooker,[2] Gray[3] realized that the plants belonged to a different genus and accordingly raised section *Physaria* to generic rank and at the same time transferred *Vesicaria didymocarpa* and *V. Geyeri* to it. The generic status of *Physaria* as a biological category has never been questioned by subsequent workers. O. Kuntze[4] substituted the name *Coulterina* for *Physaria*, contending

[1] Fl. North Am. **1**: 102 (1838).
[2] Lond. Journ. Bot. **6**: 70 (1847).
[3] Gen. Illustr. **1**: 162 (1848).
[4] Revis. Gen. **2**: 931 (1891).

that the fungus genus *Physarium* preoccupied the name. However, no such interpretation is possible under specific provisions of the International Rules of Botanical Nomenclature. *Physaria* has been studied in parts by the writers of manuals on the botany of western America, but the nearest approach to an inclusive treatment of the genus is that of Payson,[1] in which a key and notes on the distribution of the species are presented.

It is a pleasure to acknowledge unreserved cooperation from the following public or private herbaria in connection with this study: Clokey Herbarium (Cl); Gray Herbarium (G); New York Botanical Garden (NY); North Dakota Agricultural College (NDA); Rocky Mountain Herbarium (RM); United States National Herbarium (US). Collections bearing the symbol (R) are in my own herbarium.

SYNOPSIS OF THE GENUS PHYSARIA (Nutt.) Gray

Perennial, caespitose, silvery stellate; stems simple, arising laterally on a somewhat elongated caudex; basal leaves usually numerous, often terminating the caudex or its branches in rosette, form, petiolate, oblanceolate to obovate or the blade rotund, entire, dentate or divided into segments; cauline leaves present, usually few, entire or dentate; inflorescence congested to somewhat elongated, usually elongating in fruit; pedicels rigid; sepals linear-oblong, pubescent, often cucullate at apex; petals yellow or rarely purplish, usually spatulate, glabrous; siliques didymous, pubescent, often highly inflated, apical sinus present; ovules 2–6 in each loculus; style persistent; seeds brown, wingless.—Gray, Gen. Illustr. **1**: 162 (1848); Coulter, Man. Rky. Mt. Region 26 (1885); Prantl in Engler & Prantl, Nat. Pflanzenfam. **3**: 187 (1891); Robinson in Gray, Syn. Fl. N. Am. **1**: 121 (1895); Howell, Fl. Northw. Am. **1**. 52 (1897); Britt. & Brown, Ill. Fl. **2**: 135 (1897); Heller, Cat. N. Am. Pl. 88 (1900); Rydb., Fl. Colo. 154 (1906); Coulter & Nelson, Man. Cent. Rky. Mts. 217 (1909); Hayek in Beih. Bot. Centr. **27**: 311 (1911); Frye & Rigg, Northw. Fl. 186 (1912); Piper & Beattie, Fl. Se. Wash. and Adj. Ida. 121 (1914); Clements & Clements, Rky. Mt. Fls. 25 (1914); Wooton & Standley in Contrib. U. S. Nat. Herb. **19**: 270 (1915); Rydb., Fl. Rky. Mts. Adj. Pl. 330 (1917); Payson in Ann. Mo. Bot. Gard. **5**: 143 (1918); Tidestrom in Contrib. U. S. Nat. Herb. **25**: 233 (1925); Rydb., Fl. Pr. Pl. Centr. N. Am. 362 (1932); Munz, Man. So. Calif. Bot. 197 (1935); St. John, Fl. Se. Wash. Adj. Ida. 175 (1937). *Coulterina* O. Kuntze, Revis. Gen. **2**: 931 (1891). *Vesicaria*, sect. *Physaria* Nutt. ex Torr. & Gray, Fl. N. Am. **1**: 102. (1838). TYPE SPECIES: *P. didymocarpa* (Hook.) Gray.

[1] Ann. Mo. Bot. Gard. **5**: 143–147 (1918).

ARTIFICIAL KEY TO THE SPECIES

a. Style less than 3.5 mm. long (usually 1–2 mm.); replum lanceolate; basal sinus absent....*b.*
  b. Valves of silique slightly inflated, flattened contrary to replum, not keeled; apical sinus and sinus-shoulders rounded.....1. *P. oregona.*
  b. Valves of silique highly inflated, strongly keeled on margins; apical sinus and sinus-shoulders acute.....4. *P. Newberryi.*
a. Style more than 4 mm. long; replum various, but lanceolate only in *P. alpestris;* basal sinus present or absent....*c.*
  c. Apical sinus of silique shallow (less than 1 mm.); apical angle of replum acute (except in *P. Geyeri* var. *purpurea*)....*d.*
    d. Silique slightly inflated, cordate in outline, less than 1 cm. wide; ovules 2 in each loculus (sometimes 3 in var. *purpurea*).....2. *P. Geyeri.*
    d. Silique highly inflated, orbicular in outline, more than 1 cm. wide; replum lanceolate; ovules about 4 in each loculus.....3. *P. alpestris.*
  c. Apical sinus of silique deep (more than 2 mm.); apical angle of replum obtuse....*e.*
    e. Replum obovate; ovules 4 in each loculus of silique....*f.*
      f. Basal leaves 5–15 mm. long; plants densely tufted; stems less than 1 cm. long.....7. *P. condensata.*
      f. Basal leaves 15–40 mm. long; plants loosely tufted; stems about 1 dm. long.....6. *P. didymocarpa.*
    e. Replum narrowly oblong to linear-oblong (broader in *P. acutifolia* but there are only two ovules in each loculus in this species); ovules 2–6 in each loculus of silique....*g.*
      g. Sinuses of silique equal above and below; valves nearly orbicular.....8. *P. australis.*
      g. Sinuses of silique unequal (upper very deep, lower shallow or absent); valves variously shaped but not orbicular....*h.*
        h. Silique highly inflated, 1.5–3 cm. wide; valves membranaceous.....5. *P. Chambersii.*
        h. Silique moderately inflated, less than 1.5 cm. wide; valves coriaceous....*i.*
          i. Plants loosely pubescent (almost lanate); cauline leaves dentate.....9. *P. Grahamii.*
          i. Plants closely appressed-pubescent; cauline leaves entire....*j.*
            j. Basal leaves rounded at apex; apical sinus of silique broad and deep (equaling replum-length in width and depth)....*k.*
              k. Silique cordate, acute at base; basal leaves large (about 2 cm. broad).....10. *P. brassicoides.*
              k. Siliques rectangular in outline, obtuse or truncate at base; basal leaves smaller (about 1 cm. broad).....11. *P. vitulifera.*
            j. Basal leaves acute at apex; apical sinus of silique shallow or narrow and deep....*l.*
              l. Apical sinus of silique narrow (less than 1 mm.) and deep (equaling replum-length); basal sinus absent; siliques pendant, loosely stellate.....12. *P. Osterhoutii.*
              l. Apical sinus of silique broad (more than 2 mm.); basal sinus usually present but very

shallow; siliques erect or pendant, appressed-pubescent . . . . *m.*

m. Basal leaves entire or with a single broad tooth on each side, linear-oblanceolate, less than 4 cm. long; replum narrowly obovate . . . . . 13. *P. acutifolia.*

m. Basal leaves divided, broadly oblanceolate, more than 4 cm. long; replum linear, constricted . . . . . 14. *P. floribunda.*

1. P. OREGONA Watson. Perennial, caespitose, silvery stellate-pubescent throughout; caudex simple; stems several to numerous, erect or somewhat decumbent, simple, 1–3.5 dm. long including the fruiting raceme; basal leaves obovate, slender-petioled, usually incised or with a few broad teeth along the petiole, 4–6 cm. long, 8–15 mm. broad; cauline oblanceolate or broader, entire or sparsely dentate, acute, 1.5–2.5 cm. long, 3–5 mm. wide; sepals pubescent, oblong, 5–7 mm. long, about 1 mm. wide; petals lemon-yellow, spatulate, 9–12 mm. long, 2–3 mm. wide; fruiting pedicels spreading, curved upward, 1–2 cm. long; fruiting raceme 5–15 cm. long; siliques didymous, loosely pubescent with spreading stellae, inflated but not exceedingly so, flattened laterally, obreniform, 1.8–2.5 cm. broad, 10–12 mm. long; apical sinus broad and open, basal sinus lacking; replum broadly lanceolate, acute at apex, 6–8 mm. long, 2–3 mm. wide; style 1–2 mm. long; ovules 4 on each side of replum; seeds orbicular, brown, 2–3 mm. broad, 2–3 in each loculus, marginless.—Proc. Am. Acad. Arts & Sci. **17**: 363 (1882); Robinson in Gray, Syn. Fl. **1**: 121 (1895); Howell, Fl. Northw. Am. **1**: 52 (1897); Frye & Rigg, Northw. Fl. 186 (1912); Payson in Ann. Mo. Bot. Gard. **5**: 146 (1918); St. John, Fl. Se. Wash. Adj. Ida. 175 (1937). *Coulterina oregona* O. Kuntze, Revis. Gen. **2**: 931 (1891).—Western Idaho and eastern Oregon. IDAHO: Sheep Creek, Snake River Canyon, Idaho Co., April, 1935, *Constance & Rollins 1029* (NY); May, 1937, *Constance, Hedrick & Peters 1822* (G, R). OREGON: Pine Creek, Baker Co., June 23, 1880, *Cusick* (G TYPE, US ISOTYPE); April, 1881, *Cusick* (G); 1886, *Cusick* (G, US); hillsides near Snake River, May 25, 1898, *Cusick 1895* (G, US); near Imnaha, Wallowa Co., July, 1933, *Peck 17500* (NY); Cache Creek, Wallowa Co., May, 1897, *Sheldon 8183* (G, NY, US).

The outstanding distinctive characteristics of *P. oregona* are found in the silique, which is flattened contrary to the replum and only slightly inflated laterally. In these respects the species is similar to *P. Geyeri* and differs from other members of the genus. The larger silique and shorter style easily differentiate it from the latter species. *P. oregona* is an endemic of the Snake River Canyon region of Oregon and Idaho and is of interest because of its restriction to this unique area.[1]

[1] See Constance & Rollins, Proc. Biol Soc. Wash. **49**: 147 (1936).

2. P. GEYERI (Hook.) Gray, var. **typica.** Perennial, caespitose, silvery stellate-pubescent throughout; caudex usually simple; stems numerous, decumbent, simple, arising laterally, 1–3 dm. long including the fruiting raceme; basal leaves numerous, obovate, slender-petioled, entire or rarely with a few broad teeth along the petiole, 3–7 cm. long, 8–12 mm. broad; cauline entire, oblanceolate, 1.5–3 cm. long, 3–5 mm. wide; sepals oblong, pubescent with spreading stellae, 5–7 mm. long, 1–2 mm. wide; petals yellow, spatulate, 8–12 mm. long, 3–4 mm. wide; pedicels spreading, slightly curved upward or sigmoid, 1–2 cm. long; siliques didymous, inflated but not exceedingly so, obcordate, apical sinus broad and open, basal sinus absent, loosely pubescent with spreading stellae, flattened laterally, 6–9 mm. broad, 5–7 mm. long; replum ovate, apical angle acute, 4–6 mm. long, 2–3 mm. broad; style 5–7 mm. long; ovules 2 in each loculus; seeds brown, marginless, 1 or 2 in each loculus, about 2 mm. broad.—*P. Geyeri* (Hook.) Gray, Gen. Illustr. **1**: 162 (1848); Robinson in Gray, Syn. Fl. **1**: 121 (1895); Howell, Fl. Northw. Am. **1**: 52 (1897); Frye & Rigg, Northw. Fl. 186 (1912); Piper & Beattie, Fl. Se. Wash. Adj. Ida. 122 (1914); Rydb., Fl. Rky. Mts. Adj. Pl. 331 (1917) in part; Payson in Ann. Mo. Bot. Gard. **5**: 146 (1918); St. John, Fl. Se. Wash. Adj. Ida. 175 (1937). *Vesicaria Geyeri* Hook., Lond. Journ. Bot. **6**: 70 (1847). *Coultcrina Geyeri* O. Kuntze, Revis. Gen. **2**: 931 (1891).—Eastern Washington to western Montana. MONTANA: Jefferson Co., July, 1892, *F. D. Kelsey* (NY); Deer Lodge Valley, June, 1906, *M. E. Jones* (US); Madison Co., June, 1888, *F. Tweedy* (NY); Miller Creek, Missoula Co., May, 1926, *Kirkwood 2414* (G). IDAHO: shore of Lake Coeur d'Alene, Kootenai Co., July, 1895, *Leiberg 1314* (G, NY). WASHINGTON: Spokane Valley, *Geyer 476* (G isotype); Spokane River, Spokane Co., May, 1937, *Constance 1834* (G, R); June 1893, *Henderson 2384* (G); May, 1924, *St. John 7632* (G, NY); May, 1896, *Piper 2293* (G, NY); Hangman Cr., Spokane Co., May, 1893, *Sandberg & Leiberg 17* (G, NY); between Spokane River and Colville, Wilkes U. S. Explor. Exp. *435* (NY); Davenport, Lincoln Co., May 20, 1905, *M. E. Jones* (US).

The specific nature of this entity has not been questioned since its original publication by Hooker. As pointed out above, its natural relative is *P. oregona* from which it is amply distinct. *P. Geyeri* has a restricted geographical range and is apparently common in the Spokane Valley of eastern Washington where it was first discovered.

Var. **purpurea,** var. nov. Petals purple; apical angle of replum obtuse; ovules often 3 in each loculus of the silique.—Planta perennis; petalis purpureis; replo obovato basi apicique obtuso; loculis circa 3-ovulatis.—IDAHO: Bonanza, Custer Co., July 25, 1916, *Macbride & Payson 3448* (G TYPE, NY ISOTYPE); Challis Creek, Custer Co., July 1916, *Macbride & Payson 3342* (G, NY).

3. P. ALPESTRIS Suksdorf. Perennial, caespitose, silvery stellate-pu-

bescent throughout; caudex simple or rarely branched, stems several, simple, arising laterally, erect or somewhat decumbent, 5–15 cm. long including fruiting raceme; basal leaves numerous, entire, obovate, rarely acutish, tapering abruptly to a slender petiole, 3–5 cm. long, 1–2 cm. broad; cauline oblanceolate, few, 5–15 mm. long, 3–5 mm. broad; inflorescence subcorymbose; sepals oblong, pubescent, 8–10 mm. long, 1.5–2 mm. broad; petals yellow, spatulate, undifferentiated into blade and claw, 12–14 mm. long, 2–3 mm. broad; ovary incrusted with stellae; fruiting pedicels divaricate, straight, 5–10 mm. long; siliques didymous, highly inflated, with a shallow open sinus above, slightly notched below, evenly pubescent; valves subreniform, 1–1.5 cm. long, 7–10 mm. wide; replum lanceolate, acutely angled at apex, 7–10 mm. long, 1.5–2.5 mm. broad; style 5–7 mm. long; ovules 4–5 in each loculus; seeds brown, suborbicular, flattened, 2–3 mm. broad, 1–3 in each loculus.—West Am. Sci. **15**: 58 (1906); Payson in Ann. Mo. Bot. Gard. **5**: 147 (1918); G. N. Jones in Univ. Wash. Publ. **7**: 91 (1938). *P. didymocarpa* Howell, Fl. Northw. Am. **1**: 52 (1897) in part; Frye & Rigg, Northw. Fl. 186 (1912).—West-central Washington. WASHINGTON: locality uncertain, Wilkes U. S. Expl. Exp. *888* (NY, US); Mt. Stuart region, Chelan Co., Aug., 1930, *Thompson 5813* (G); Tronson Ridge, Chelan Co., June, 1932, *Thompson 8595* (G, NY); June, 1933, *Thompson 8966* (G, NY); Three Brothers, Chelan Co., June, 1934, *Thompson 10540* (NY); Beverly Creek, Kittitas Co., July, 1932, *Thompson 8708* (G, NY); near Liberty, Kittitas Co., June, 1935, *Thompson 11578* (G, NY); Mount Paddo (Adams), July 12, Sept. 2, 1900, *Suksdorf 2648* (G, NY isotypes); Aug. 30, 1904 and July 27, 1906, *Suksdorf 4137* (G).

P. alpestris has been critically discussed elsewhere. It stands well apart as a species both on morphological and geographical grounds. The nearest relative from a technical standpoint appears to be *P. oregona*, but the species is also related to *P. Chambersii* on account of the large highly inflated fruits and orbicular entire basal leaves. However, the replums of the two are decidedly different and it seems probable that their ancestory was entirely different.

4. P. NEWBERRYI Gray. Perennial, caespitose, silvery-stellate throughout; caudex simple or branched; stems several to numerous, erect, simple, arising laterally, 0.5–1 dm. long including the fruiting raceme; basal leaves obovate, incised or merely dentate with broad teeth, slender-petioled, 4–8 cm. long, 1.5–2.5 cm. broad; cauline few, entire, oblanceolate, 1–2 cm. long, 3–4 mm. wide; sepals linear-oblong, pubescent, 7–9 mm. long, about 1 mm. wide; petals yellow, ligulate, often truncate at apex, 10–13 mm. long, 2–3 mm. wide; fruiting raceme dense, 3–5 cm. long; pedicels rigid, straight, divaricate, 5–10 mm. long; siliques didymous, highly inflated, apical sinus broad the shoulders angular, evenly covered with appressed stellae; valves

keeled on both outer margins, each valve 8–12 mm. wide, 12–16 mm. long; replum linear, acute at apex, 8–10 mm. long, 1–1.5 mm. wide; style 2–3 mm. long; ovules 2–4 in each loculus; seeds obovate, light brown, marginless, 2–3 mm. wide, 3–4 mm. long.—Ives' Report Colo. River, pt. 4. 6 (1860); Robinson in Gray, Syn. Fl. **1:** 121(1895) in part; Coulter & Nelson, Man. Cent. Rky. Mts. 218 (1909) in part; Wooton & Standley in Contrib. U. S. Nat. Herb. **19.** 270 (1915); Rydb., Fl. Rky. Mts. Adj. Plains 331 (1917) in part; Payson in Ann. Mo. Bot. Gard. **5:** 146 (1918). *P. didymocarpa* var. *Newberryi* Jones in Proc. Calif. Acad. Sci. **2:** 5. 624 (1895) in part. *Coulterina Newberryi* O. Kuntze, Revis. Gen. **2:** 931 (1891).—New Mexico to northern Arizona. NEW MEXICO: locality uncertain, western New Mexico, May, 1869, *E. Palmer* (G, NY, US); near Tegua, May 14, 1858, *J. S. Newberry* (G TYPE, NY, US ISOTYPES); Fort Wingate, 1882 & 1883, *W. Mathews* (G); May 27, 1883, *C. D. Walcott 43* (US); Gallup, June 14, 1916, *Eastwood 5595* (G, US). ARIZONA: Cave Dwellers Mt., east of Mt. Agassiz, Aug., 1884, *Lemmon 3356* (G); Sunset Peak, Flagstaff, June, 1928, *Osterhout 7000* (RM); July, 1923, *H. C. Hansen 620* (RM); July, 1937, *R. E. Collom 746* (US); May–Oct., 1900, *Purpus 7075* (US); July, 1901, *Leiberg 5699* (US); 15 miles no. of Granado, Apache Co., June, 1937, *Peebles & Smith 13478* (US); San Francisco Mts., June, 1887, *E. A. Mearns* (NY); near Flagstaff, June, 1891, *McDougal 154* (US).

Physaria Newberryi is one of the most distinctive species of the genus and it is, therefore, difficult to understand why confusion over its relationship to other members has been so general. It would seem from the identifications on many specimens that any plant with highly inflated siliques, regardless of other characteristics, has been considered to be good *P. Newberryi.* Actually the V-shaped apical sinus, short style and straight-sided siliques are distinctive characteristics which well define this species.

5. P. **Chambersii**, sp. nov. Herba perennis caespitosa undique indumento argenteo-stellato tecta; caulibus decumbentibus vel erectis 5–15 cm. longis; foliis radicalibus obovatis vel rotundatis integris vel dentatis 3–6 cm. longis, 1–2 cm. latis; foliis caulinis integris spathulatis acutis 1–2 cm. longis, 3–6 mm. latis; inflorescentiis laxis; sepalis lineari-oblongis 6–8 mm. longis, 1 mm. latis; petalis flavis spathulatis 10–12 mm. longis, 3–4 mm. latis; pedicellis fructiferis divaricatis 8–15 mm. longis; siliquis didymis inflatis pubescentibus; loculis subreniformibus 1–1.5 cm. longis, ca. 1 cm. latis; replo oblongo 4–6 mm. longo, 1 mm. lato; stylo 6–8 mm. longo; loculis di- vel hexispermis; seminibus exalatis.

Perennial, caespitose, silvery stellate throughout; stems numerous from a simple caudex, arising laterally, erect or very often decumbent, simple, 5–15 cm. long including the fruiting raceme; radical leaves

entire or dentate, obovate to orbicular, slender-petioled, 3–6 cm. long, 1–2 cm. broad; cauline few, entire, spatulate, often acute, 1–2 cm. long, 3–6 mm. wide; inflorescence rather lax; sepals linear-oblong, pubescent, 6–8 mm. long, 1 mm. wide; petals yellow, spatulate, 10–12 mm. long, 3–4 mm. wide; fruiting raceme congested, 2–10 cm. long; pedicels divaricate, slightly sigmoid, 8–15 mm. long; siliques didymous, greatly inflated, evenly and often densely pubescent, often purplish at maturity, obtuse to slightly cordate at base; apical sinus deep and open, crests rounded; valves subreniform, each valve 1–1.5 cm. long, about 1 cm. wide; replum oblong, obtuse at apex, 4–6 mm. long, 1 mm. wide; style 6–8 mm. long; ovules 2–6 (mostly 4) on each side of the replum; seeds orbicular, flattened, brown, 2–3 mm. broad, 2–4 in each loculus, marginless.—*P. didymocarpa* Howell, Fl. Northw. Am. **1**: 52 (1897) in part. *P. Newberryi* Rydb., Fl. Rky. Mts. Adj. Pl. 331 (1917) in part; Tidestrom in Contrib. U. S. Nat. Herb. **25**: 233 (1925) in part; Munz, Man. So. Calif. Bot. 198 (1935).—Utah and Nevada. UTAH: Pahvant Butte, Millard Co?, May, 1925, *A. J. Harris C2518* (G); southern Utah, 1877, *E. Palmer 34* (NY, US); Thistle Junction, June, 1900, *S. G. Stokes* (NY, US); Cedar City, May, 1894, *M. E. Jones 5202* (NY, US); Marysvale, June, 1894, *M. E. Jones 5397c* (NY, US); Ephraim, San Pete Co., May, 1914, *Eggleston 10111* (US); Mt. Nebo, Juab Co., Aug., 1905, *Rydberg & Carleton 7701* (NY); Parley's Canyon, Salt Lake Co., June, 1923, *Garrett 3031* (G). NEVADA: Clover Mts., July, 1893, *E. L. Greene* (NY); Santa Rosa Mts., Humboldt Co., July, 1898, *Cusick 2025* (G, US); Lamoille Canyon, Ruby Mts., Elko Co., July, 1938, *Rollins & Chambers 2568* (G, R); Aug., 1908, *Heller 9378* (NY, US); 36 mi. w. of Wendover, Elko Co., June, 1934, *Maguire 5808* (G); 20 mi. sw. of Jiggs, Eureka Co., July, 1938, *Rollins & Chambers 2543* (G, R); mountain slopes of Jet Canyon, 15 mi. west of Round Mountain, Toiyabe Mts., Nye Co., July, 1938, *Rollins & Chambers 2502* (G TYPE, R ISOTYPE); Bunker Hill, Toiyabe Forest, July, 1913, *A. E. Hitchcock 860* (US); Trail Canyon, White Mts., Esmeralda Co., July, 1932, *Duran 3349* (G, NY); Mt. Gabb, Palmetto Range, 1898, *Purpus 5863* (US); Karshaw, Lincoln Co., May, 1902, *Goodding 973* (G, NY); Kyle Canyon, Charleston Mts., July, 1936, *Clokey 7102* (R, Cl); Clark Canyon, Charleston Mts., May, 1936, *Clokey & Anderson 7099* (R, Cl); Cold Cr., Charleston Mts., June, 1938, *Clokey 7946* (Cl). OREGON: Sheaville, Malheur Co., June, *Percy Train* (US) (This is a flowering specimen which is provisionally placed here. Certainly it is not *P. oregona* Wats. as determined by the collector).

Physaria Chambersii is somewhat related to *P. Newberryi* and has been confused with it by several botanists. The technical characters of the two species show that the relationship is not a particularly close one. Both have a broad open sinus at the base of the style and the siliques are large and highly inflated, but here similarity of silique-

characteristics cease. The siliques of *P. Newberryi* have keeled apical margins, truncate base, sinus-crests decidedly angular, style 2–3 mm. long, replum 8–10 mm. long with acute apex and straight-sided valves, whereas in *P. Chambersii* the siliques have rounded sides and apical margins, cordate or nearly truncate base, sinus-crests rounded, style 8–13 mm. long and replum 3–6 mm. long with an obtuse apex. Actually, *P. Chambersii* has a closer relative in *P. australis*. The latter has much smaller coriaceous siliques with closed sinuses of equal depth, whereas *P. Chambersii* has large chartaceous siliques with a deep open apical sinus and a basal sinus which is very shallow or entirely absent. The two species occupy different geographical areas as well.

Variation in the number of ovules in different collections of *P. Chambersii* is puzzling. The ovule-number is consistent for any given collection, but accompanying significant morphological changes apparently have not taken place. Thus, it is possible to find among the collections which are considered to belong to this species a number which have only two ovules in each loculus, a number with four and a few with six. I have not found any variation in number in different siliques from the same plant nor from different plants of the same collection. It would seem from this that a reduction in ovule-number may be independent of other changes in the plant and having once occurred it tends to become fixed or constant. If this is of survival value to the plant, it might be reasonably supposed to be of importance in the origin of new biologically natural entities in the genus.

Var. **membranacea**, var. nov. Herba perennis caespitosa; foliis radicalibus oblanceolatis integris acutis; foliis caulinis integris linearioblanceolatis acutis; loculis subreniformibus 1–2 cm. longis, 1–1.5 cm. latis; replo lineari 3–4 mm. longo, 1 mm. lato; stylo persistente 8–12 mm. longo; loculis dispermis.

Caespitose perennial; radical leaves oblanceolate, acute, entire, slender-petioled; cauline entire, linear-oblanceolate, acute; siliques membranaceous, highly inflated, light yellowish, with a deep open sinus above, cordate below, evenly pubescent with appressed stellae; valves subreniform; replum linear, obtuse at apex, 3–4 mm. long, 1 mm. wide; ovules 2 in each loculus.—UTAH: Red Canyon, 16 miles west of Bryce Canyon National Park, Garfield Co., July 6, 1938, *Reed C. Rollins & T. S. Chambers 2448* (G TYPE, R ISOTYPE); Bryce Canyon, Garfield Co., July, 1930, *Goodman & Hitchcock 1567* (NY).

6. P. DIDYMOCARPA (Hook.) Gray. Perennial, caespitose, silvery-stellate throughout, stellae branched or simple, often stalked; stems numerous, simple, decumbent, rather leafy for the genus, about 1 dm.

high; radical leaves numerous, obovate, repand or dentate, rarely entire, usually with an angular apex, long-petioled, 1.5–4 cm. long, 8–16 mm. wide; cauline oblanceolate, acute, entire or with an occasional tooth, 1–2 cm. long, 4–8 mm. wide; inflorescence congested, elongating in fruit; sepals pubescent, 6–8 mm. long, 1.5–2 mm. wide, often keeled; petals yellow, spatulate, 10–12 mm. long, 3–4 mm. wide; pedicels spreading, straight or very slightly curved, 8–12 mm. long; siliques didymous, inflated, erect, with deep narrow usually closed apical sinus and similar basal sinus, loosely pubescent with spreading stellae; valves 8–12 mm. long, 6–8 mm. wide; replum obovate to broadly oblong, not constricted, obtuse at apex, 3–4 mm. long, 2–3 mm. broad; style 7–9 mm. long; ovules 4 on each side of replum; seeds marginless, brown, about 2.5 mm. broad, 2–3 in each loculus.

Basal leaves entire, rounded; siliques appressed-pubescent..Var. *integrifolia.*
Basal leaves dentate or angular; siliques with a dense spreading pubescence.
Basal leaf-bases lanate, pubescence spreading throughout.....Var. *lanata.*
Basal leaf-bases not lanate, pubescence appressed except on the siliques.....Var. *normalis.*

Var. NORMALIS O. Kuntze, Revis. Gen. **1**: 35 (1891). *P. didymocarpa* Gray, Gen. Illustr. **1**: 162 (1848); Coulter, Man. Rky. Mt. Reg. 26 (1885) in part; Britt. & Brown, Ill. Fl. **2**: 135 (1897) in part and ed. 2. **2**: 156 (1913) in part; Coulter & Nelson, Man. Cent. Rky. Mts. 217 (1909) in part; Rydb. Fl. Rky. Mts. Adj. Pl. 330 (1917) in part; Payson in Ann. Mo. Bot. Gard. **5**: 144 (1918); Rydb., Fl. Pr. Pl. Cent. N. Am. 262 (1933) in part. *Vesicaria didymocarpa* Hook., Fl. Bor.-Am. **1**: 49 (1830). *Coulterina didymocarpa* O. Kuntze, Revis. Gen. **2**: 931 (1891). *P. macrantha* Blankinship in Mont. Agric. Coll. Sci. Stud. **1**, pt. 2: 60 (1905).—Northern Alberta to Wyoming. CANADA: locality uncertain, Rky. Mts., 1858, *Bourgeau* (G, NY); Franklin's Journey (NY). ALBERTA: Kootenay Plains, June, 1908, *S. Brown 970* (G, NY); jct. north fork and n. branch Saskatchewan R., June, 1908, *S. Brown 917* (G); Banff, July, 1907, *Butters & Holway 41* (G, NY); June, 1906, *S. Brown 123* (G); Bow River Pass, Sept., 1879, *Macoun 89* (G); Morley, June, 1885, *Macoun* (G, NY); Rky. Mt. Nat. Park, July, 1897, *Van Brunt 70* (NY); July, 1904, *John Macoun 64432* (G, NY). MONTANA: Little Belt Mts., Aug., 1896, *Flodman 596* (NY); Belt Mts., July, 1886, *F. W. Anderson 411* (NY); Cedar Mt., July, 1897, *Rydberg & Bessey 4168* (NY); Lima, June, 1895, *Shear 3406* (NY); Livingston, 1901, *Scheuber 363* (NY); near Indian Cr., July, 1897, *Rydberg & Bessey 4166* (NY); Bozeman, May, 1901, *E. J. Moore* (G); Midvale, July, 1903, *Umbach 305* (G); Granite Butte, Sept., 1912, *Owen Byrnes 127* (G, isotype of *P. macrantha* Blankin.); Bridger Mts., June, 1897, *Rydberg & Bessey 4167* (G). WYOMING: Glen Cr., Y. N. Park, June, 1899, *A. & E. Nelson 5570* (G, NY); near Mammoth Hot Spgs., July, 1893, *Burglehaus 6318* (NY); Mt. Leidy, Aug., 1897, *Tweedy 391*

(NY); Medicine Mt., Big Horn Co., July, 1936, *L. & R. Williams 3228* (G, NY).

Plants of *P. didymocarpa* are remarkably uniform from the northernmost portion of its range, extending as far south as northern Wyoming, but specimens from west-central Wyoming show certain transitional stages toward its southern analogue, *P. australis*. These plants, while possessing a broad replum and four ovules in each loculus of the ovary, have appressed stellae on the siliques and entire obtuse basal leaves. The whole series is rather obviously a single line and the segregation of *P. australis* as a distinct entity must have been a comparatively recent evolutionary development. Two varieties of *P. didymocarpa* are recognized in the present treatment and apparently represent two lines of divergence from the parent species. Both have distinctive geographical areas which border the southern margin of the range of variety *normalis*.

Var. LANATA A. Nelson in Bull. Torr. Bot. Club **31**: 241. (1904); Coulter and Nelson Man. Cent. Rky. Mts. 217. (1909); Payson in Ann. Mo. Bot. Gard. **5**: 145 (1918). *P. lanata* Rydb. in Bull. Torr. Bot. Club **39**: 322 (1912); Rydb., Fl. Rky. Mts. Adj. Plains 330. (1917).—Central Wyoming. WYOMING: Head of middle fork of Powder River, Big Horn Co., July, 1901, *Goodding 326* (G, NY ISOTYPES); Wallace Creek, Natrona Co., July, 1894, *A. Nelson 674* (G); foothills Sheridan-Buffalo, June–July, 1900, *Tweedy 3585* (NY).

Var. **integrifolia**, var. nov., caespitosa incana; foliis radicalibus integris obovatis; siliquis pubescentibus adpressis.—West-central Wyoming. WYOMING: Grand Canyon of Snake River, Lincoln Co., July 8, 1932, *L. Williams 809* (G TYPE, NY ISOTYPE); hills east of Afton, Lincoln Co., June, 1923, *Payson & Armstrong 3825* (G); Adams Ranch, Jacksons Hole, July, 1901, *Merrill & Wilcox 965* (G); Gros Ventre River, Aug., 1894, *A. Nelson 927* (G); Headwaters Cliff Creek, Aug., 1900, *C. C. Curtis* (NY).

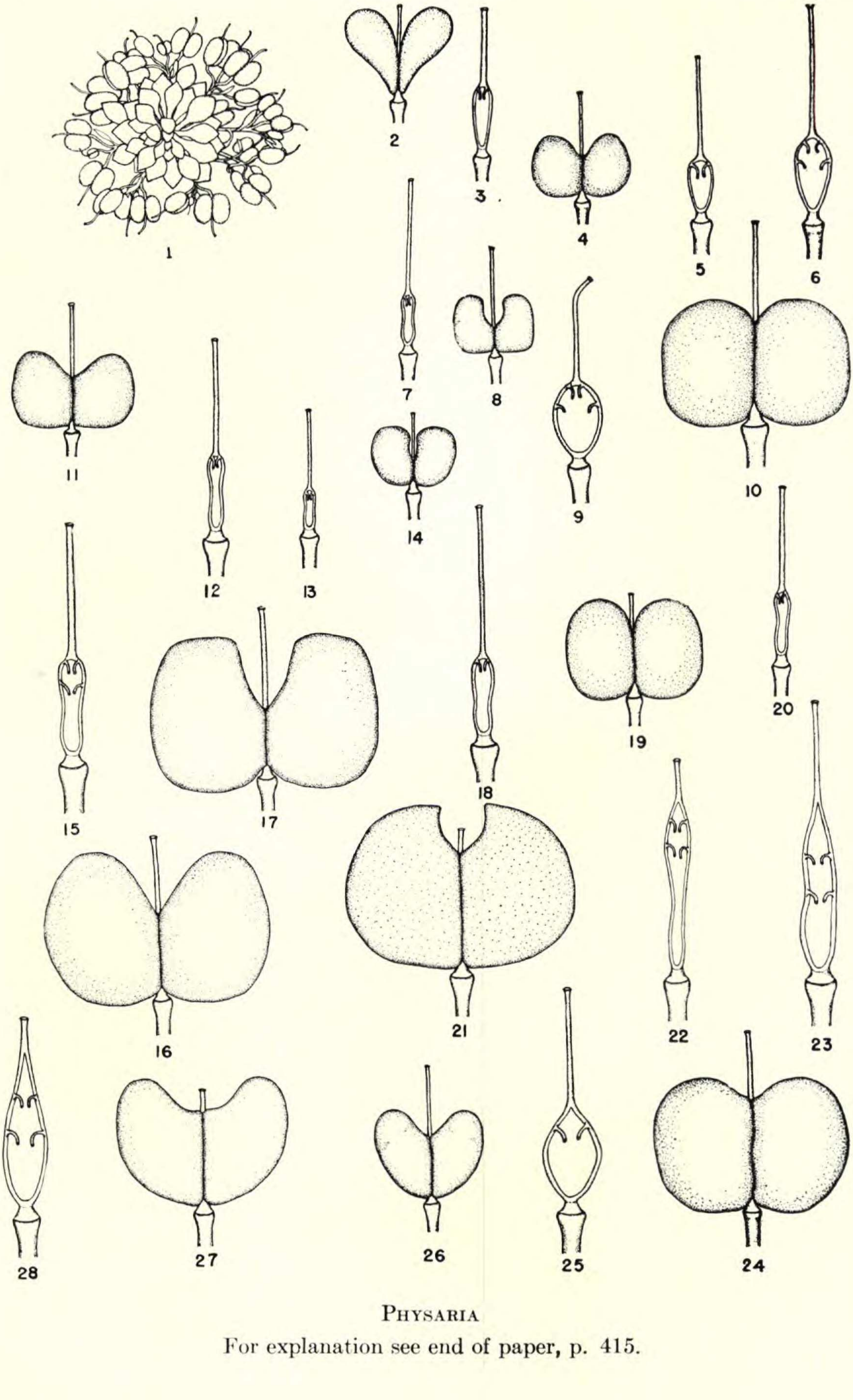
7. P. **condensata**, sp. nov. Herba perennis caespitosa argentea stellato-pubescentia; caulibus simplicibus brevibus 0.5–1 cm. altis; foliis radicalibus numerosissimis integris obovatis 0.5–1.5 cm. longis, 4–8 mm. latis; foliis caulinis paucis oblanceolatis 5–10 mm. longis, 2–3 mm. latis; pedicellis fructiferis divaricatis rigidis 5–10 mm. longis; siliquis inflatis didymis pubescentibus apice basique cordatis; loculis subsphaeroideis 4–8 mm. diametro; replo obovato 3–4 mm. longo, 2–3 mm. lato; stylo persistente 4–6 mm. longo; seminibus suborbicularibus exalatis 2 mm. diametro; cotyledonibus accumbentibus.

Perennial, caespitose, silvery-stellate throughout; caudex simple or rarely branched, greatly enlarged and invested with old leaf-bases; stems several to many, arising laterally from the caudex beneath a dense rosette of leaves, stellate-pubescent, less than 1 cm. long; basal

leaves entire, obovate, tapering abruptly to a narrow petiole, silvery from a dense incrustation of appressed stellae, usually acute, 0.5–1.5 cm. long, 4–8 mm. broad; cauline leaves few, oblanceolate, entire, densely stellate, 5–10 mm. long, 2–3 mm. broad; fruiting raceme congested, subumbellate, often almost sessile; pedicels divaricate, straight, 5–10 mm. long; siliques inflated, didymous with a deep sinus at apex and base, pubescent with loosely spreading stellae, inner surface glabrous, loculi 4–8 mm. in diameter; replum obovate, 3–4 mm. long, 2–3 mm. wide; style 4–6 mm. long; ovules 4 in each loculus, 1 or 2 abortive; seeds brown, orbicular, flattened, marginless, 2–4 in each loculus, about 2 mm. in diameter; cotyledons accumbent; flowers unknown.—WYOMING: limy knoll-crest, foothills of Bridger Butte, 3 miles west of Fort Bridger, Uinta County, June 24, 1938, *Reed C. Rollins 2385* (G TYPE, R ISOTYPE).

Physaria condensata is analogous in growth-form to *Lesquerella condensata* A. Nelson, by which the specific name is suggested. Both species inhabit unprotected knoll-crests in the Upper Sonoran Life-Zone of southwestern Wyoming, though the latter has a much wider geographic range. *P. condensata*, as shown by its technical characters, is most closely related to *P. didymocarpa*. However, the two species differ so strikingly in growth-habit that they could scarcely be confused either in the field or laboratory. *P. condensata* possesses a dense flat rosette of entire leaves which terminates each sobole or the single caudex, resembling in a general way certain flat-leaved species of *Sedum*. The stems are less than a centimeter long and the whole plant is condensed into a tuft less than five centimeters across. The plant in its normal habitat barely projects above the ground-surface. This is strikingly contrasted with the loose habit of growth, well-developed stems and dentate leaves of *P. didymocarpa*.

8. P. **australis** (Payson), comb. nov. Perennial, caespitose, silvery-stellate throughout, stellae many rayed, rays forked; stems numerous, usually somewhat decumbent, simple, arising laterally, 5–15 cm. long including the fruiting raceme; basal leaves numerous, entire or very rarely with a few scattered teeth, 2–8 cm. long, 5–30 mm. broad, blade obovate to orbicular, obtuse; petiole slender, often narrowly winged; cauline entire, spatulate to oblanceolate, usually obtuse, 1–3 cm. long, 3–8 mm. wide; inflorescence racemose, elongating in fruit; sepals linear-oblong, pubescent; petals spatulate, yellow, about 1 cm. long; pedicels divaricate, slightly sigmoid or nearly straight, 6–12 mm. long; siliques erect, didymous, inflated, pubescent, apical sinus deep, narrow and closed or nearly so, basal sinus similar to apical; valves suborbicular, 6–10 mm. high, 3–6 mm. wide; replum oblong, constricted, 2–3 mm. long; ovules 2 in each loculus; style 4–6 mm.



PHYSARIA

For explanation see end of paper, p. 415.

long; seeds brown, suborbicular, wingless, 2–3 mm. broad.—*P. didymocarpa* (Hook.) Gray var. *australis* Payson in Ann. Mo. Bot. Gard. **5.** 144 (1918); E. H. Graham in Ann. Carneg. Mus. **26.** 220 (1937). *P. didymocarpa* Torr. in Stansbury Expl. & Surv. Great Salt Lake App. D. 284 (1852); Rydb., Fl. Colo. 154 (1906) in part; Coulter & Nelson, Manual Cent. Rky. Mts. 217 (1909) in part; Rydb., Fl. Rky. Mts. Adj. Pl. 330 (1917) in part; Tidestrom in Contrib. U. S. Nat. Herb. **25:** 233 (1925).—Idaho and Wyoming to New Mexico and Utah. IDAHO: Soda Springs, Bannock Co., June, 1920, *E. B. & L. B. Payson 1701* (G, NY). WYOMING: Sand Creek, Albany Co., June, 1900, *Nelson 7026* (G, NY); Camel Rock, Albany Co., June 21, 19 ?, *Schwartz & Garner 51* (G); Dyer's Ranch, Carbon Co., June, 1901, *Goodding 80* (G); Fort Steele, Carbon Co., May–June, 1901, *Tweedy 4488* (NY); Bad Water, Fremont Co., June, 1910, *A. Nelson 19403* (G); Green River, Sweetwater Co., June, 1895, *Shear 4364* (US), June, 1938, *Rollins 2241* (G, R); Blacks Fork River, Uinta Co., June, 1937, *Rollins 1653* (G, NY, R); 3 mi. w. Fort Bridger, Uinta Co., May, 1938, *Rollins 2229* (G, R); June, 1938, *Rollins 2387* (G, R); 20 mi. west Big Piney, Lincoln Co., July, 1922, *E. B. & L. B. Payson 2618* (G, NY). COLORADO: Naturita, Montrose Co., April, 1914, *Payson 247* (G); Norwood Hill, San Miguel Co., Aug., 1912, *Walker 490* (G); Paradox, Montrose Co., June, 1912, *Walker 89* (G, US); Hills about Dolores, June, 1892, *C. S. Crandall* (G); 10 mi. so. Montrose, Montrose Co., May, 1938, *Rollins 2134* (G); 8 mi. w. Grand Junction, Mesa Co., May, 1938, *Rollins 2176* (G, R); 20 mi. no. Rifle, Rio Blanco Co., May, 1938, *Rollins 2209* (G, R); dry hills near Meeker, Rio Blanco Co., May, 1938, *Rollins 2220* (G, R); Durango, June, 1898, *Crandall* (NY); Mancos, June, 1898, *Baker, Earle & Tracy 75* (G, US); Mesa Verde Park, May, 1925, *A. Nelson 10425* (NY). NEW MEXICO: Aztec, April, 1899, *Baker 356* (G, NY, US); vicinity of Farmington, San Juan Co., July, 1911, *Standley 7129* (US). UTAH: Logan Canyon, Cache Co., April, 1911, *C. P. Smith 2331* (NY), May, 1934, *Bassett & Ruth Maguire 15956* (G); Wahsatch Mts., July, 1869, *S. Watson 83* (NY); Orangeville, June, 1894, *M. E. Jones 5464* (US); Price, June, 1900, *Stokes* (NY); Theodore, Uintah Co., May, 1908, *M. E. Jones* (NY); 47 mi. so. Moab, June, 1933, *B. Maguire et al. 5809* (US); Flaming Gorge, Daggett Co., May, 1932, *L. Williams 458* (G, NY); La Sal Mts., July, 1911, *Rydberg & Garrett 8573* (NY); June, 1913, *M. E. Jones* (NY); 4 mi. w. Willow Creek, Uintah Co., June, 1937, *Rollins 1708* (G, R).

A careful examination of numerous specimens of Payson's variety *australis* has revealed a number of fundamental characteristics which indicate its distinctness as a separate species from *P. didymocarpa.* Chief among these is a reduced number of ovules in each loculus of the ovary. In *P. didymocarpa* there are four[1] ovules in each of the two

[1] Figs. 9 and 10, tab. XVI, Hook. Fl. Bor.-Am. must certainly be in error as to the number of ovules. I have examined the siliques of over thirty collections of this

loculi. Often one and sometimes two ovules abort, consequently only two or three seeds mature on each side of the replum. *P. australis* has only two ovules in each loculus and the funiculi are at the very apex of the replum. Usually one of the two ovules aborts, leaving only one which matures. Equally consistent but possibly less fundamental is the difference in the nature of the replum of these species. *P. australis* has a very narrowly linear constricted replum which is less than 1 mm. wide, whereas the replum of *P. didymocarpa* is oblong to obovate and 2–3 mm. wide. When these constant differences are added to those pointed out by Payson the specific nature of *P. australis* becomes apparent.

9. P. GRAHAMII Morton. Perennial, caespitose, densely pubescent throughout with spreading stellae; stems simple, somewhat decumbent, about 1.5 dm. long; basal leaves numerous, broadly oblanceolate to broadly spatulate, obtuse, irregularly pinnatifid, 10–15 cm. long, about 3 cm. broad, distal lobes large and variable; cauline few, dentate or rarely entire; pedicels divergent, 5–15 mm. long; sepals linear-oblong, pubescent, about 5 mm. long; petals yellow, spatulate, 6–8 mm. long; siliques erect, didymous, inflated but not highly so, shallow sinus below, deep sinus above; replum linear-oblong, somewhat constricted, ovules 2 on each side; style 6–8 mm. long; mature seeds unknown.—Morton in E. H. Graham in Ann. Carneg. Mus. **24**: 220 (1937).—UTAH: Chandler Canyon, Uinta Basin, Uintah County, Aug. 3, 1935, *Graham 9976* (US TYPE).

The type of this species is not altogether satisfactory because the fruits are very immature. Its distinctiveness rests upon the fact that the whole plant is covered with very loose spreading stellae and that the large basal leaves are deeply lobed along the margins. *P. Grahamii* is at present known only from the type collection.

10. P. BRASSICOIDES Rydberg. Perennial, caespitose, silvery-stellate throughout, stellae with forked rays; stems several to numerous, rather stoutish for the genus, simple, arising laterally, 5–15 cm. long including the fruiting raceme; basal leaves numerous, thick, scurfy above, repand or rarely entire, 2–6 cm. long, 1–2.5 cm. broad, blade orbicular to obovate, petiole somewhat winged; cauline few, oblanceolate to broadly spatulate, obtuse or approaching acuteness, entire, 1–2 cm. long, 3–5 mm. wide; sepals linear-oblong, 6–8 mm. long, about 1 mm. wide; petals yellow, spatulate, about 1 cm. long, 3–4 mm. wide; pedicels divergent, straight or somewhat curved, 5–10 mm. long; si-

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species and consistently find four ovules on each side of the replum. The drawings are also in error as to the acute apex of the replum. This is characteristic of *P. Geyeri* and is probably taken from Douglas' plants which Hooker cited. The apical angle of the replum of *P. didymocarpa* is decidedly obtuse.

liques didymous, erect, cordate, inflated but not greatly so, loosely but densely pubescent with spreading stellae, obtuse or with an obscure sinus at base, apical sinus deep and broad, valves 6–8 mm. high; replum linear-oblong, constricted, 3–4 mm. long, about 1 mm. wide; ovules 2 in each loculus; style 4–5 mm. long; seeds brown, 2–3 mm. broad.—Bull. Torr. Bot. Club **29**: 237 (1902); Peterson, Fl. Neb. 62 (1912); Rydb., Fl. Rky. Mts. Adj. Pl. 331 (1917); Payson in Ann. Mo. Bot. Gard. **5**: 145 (1918); Rydb., Fl. Pr. Pl. Cent. N. Am. 362 (1932). *P. didymocarpa* Britt. & Brown, Ill. Fl. ed. 2. **2**: 156 (1913) in part; Bergman, Fl. N. Dak. 191 (1918); Winter in Contrib. Bot. Surv. Neb. n. s. **10**: 71 (1936).—NORTH DAKOTA: Medora, July 17, 1898, *L. R. Waldron* (NDA, NY); June 19, 1910, *H. F. Bergman* (NDA); Gorham, McKenzie Co., May, 1938, *E. C. Moran 399 & 400* (G). SOUTH DAKOTA: cultivated at Brookings from seed collected in badlands, *Th. A. Williams* (G). NEBRASKA: canyon south of Scott's Bluff, Scott's Bluff Co., July, 1891, *Rydberg 24* (NY TYPE, US ISOTYPE); badlands, 1853–4, *F. V. Hayden* (NY). WYOMING: 1 mi. northwest of Hulett, Crook Co., May, 1935, *Owenby 610* (NY, R).

An inhabitant of bluffs and badlands in the western plains region, *P. brassicoides* is one of the least known species of the genus *Physaria*. Its affinities are with *P. didymocarpa* var. *lanata* on the one hand and *P. vitulifera* on the other. The dense loose whitish vestiture of the siliques immediately suggests *P. didymocarpa* and its variety *lanata*, but the replum is constricted, the ovules number two in each cell and the base of the silique is almost devoid of a sinus like that of *P. vitulifera*. From the latter species it differs in having very much larger, almost entire thickish basal leaves, larger more highly inflated obpyriform siliques and a longer replum. Little difficulty should be experienced in placing specimens of this rather unique species.

11. P. VITULIFERA Rydberg. Perennial, caespitose, silvery stellate-pubescent throughout; stellae with numerous branched rays; stems numerous, usually decumbent, arising laterally, simple, rather coarse, 1–2 dm. long including fruiting raceme; basal leaves numerous, pandurate or merely obovate, obtuse, margins deeply and broadly incised or rarely almost entire, 3–6 cm. long, 1–2 cm. broad; cauline entire, oblanceolate to spatulate, often somewhat acute, 3–6 mm. broad; inflorescence congested, elongating in fruit; sepals oblong, pubescent, 6–8 mm. long, 1.5–2 mm. wide; petals yellow, spatulate, about 1 cm. long, 3–4 mm. wide; pedicels sigmoid, the end usually curving upward; siliques didymous, often rigid, inflated, somewhat angular, pubescent with loose spreading stellae, obtuse or truncate below, apical sinus broad, open and deep; valves 5–6 mm. high, 3–4 mm. broad; replum oblong, often constricted, 2–3 mm. long, less than 1 mm. wide, 2 ovules on each side; style 5–7 mm. long; seeds 1–2 in each loculus,

brown, about 2.5 mm. broad, wingless.—Bull. Torr. Bot. Club **28**: 278 (1901); Rydb., Fl. Colo. 154 (1906); Coulter & Nelson, Man. Cent. Rky. Mts. 218 (1909); Rydb., Fl. Rky. Mts. Adj. Pl. 330. (1917); Payson in Ann. Mo. Bot. Gard. **5**: 145 (1918). *P. didymocarpa* Clements & Clements, Rky. Mt. Fls. 25 (1914) in part. *P. didymocarpa* β *contractoreplum* O. Kuntze, Revis. Gen. Pl. **1**: 35 (1891).—COLORADO: without locality, Sept., 1874, *O. Kuntze 3058* (NY isotype of *P. didymocarpa* β *contractoreplum*); Idaho Springs, Aug., 1895, *Rydberg* (NY TYPE); June, 1916, *Clokey 2753* (NY); Aug., 1895, *Shear 3269* (NY, US); near Golden, June, 1918, *Churchill* (G); July, 1917, *E. L. Johnston 1019* (G); April, 1892, *Crandall 45* (NY, US); May, 1920, *Duthie & Clokey 3777* (Cl, G, NY, US); Morrison, Jefferson Co., July, 1920, *Clokey 3776* (Cl); near Boulder, July, 1902, *Tweedy 5068* (NY); Clear Creek-Middle Park, 1861, *Parry 101* (G, NY); Platte River, Evans, June, 1910, *E. L. Johnston 633 & 633b* (NY).

P. vitulifera has two close relatives in *P. floribunda* and *P. Osterhoutii*. Its position appears to be somewhat intermediate between these two species both morphologically and geographically. The plant ranges along the western edge of the plains and in canyons and valleys toward the interior of the central Rocky Mountains of Colorado. *P. Osterhoutii* occurs northwest and *P. floribunda* occurs to the south and west of this area.

The basal leaves of *P. vitulifera* are similar to those of *P. floribunda*, but they are nearly always obtuse instead of acute and obovate instead of broadly oblanceolate. The fruits are angular, rigid in appearance and not highly inflated. Stellae on the siliques are not appressed as on the foliage, but, as in *P. Osterhoutii*, spread at almost right angles from it. As a biological entity, the boundaries of *P. vitulifera* are seemingly well defined; however, recent connections with its relatives are strongly indicated.

12. P. OSTERHOUTII Payson. Perennial, caespitose, silvery-stellate throughout, rays of stellae usually forked; caudex simple or branched; stems slender, numerous, erect or somewhat decumbent, arising laterally, simple, 8–15 cm. long including the raceme; basal leaves oblanceolate, often hastate, incised or with broad teeth along the petiole, rarely entire, 2–5 cm. long, 8–15 mm. wide; cauline linear-oblanceolate, acute, entire or rarely with a few teeth, 1–2 cm. long, 2–3 mm. wide; inflorescence congested, flowers numerous; sepals linear-oblong, yellowish, pubescent, 5–7 mm. long, about 1 mm. wide; petals yellow, spatulate, 8–10 mm. long, 3–4 mm. wide; pedicels recurved in fruit, 1–1.5 cm. long; fruiting raceme congested, 4–8 cm. long; siliques pendant, base truncate or obtuse, apex deeply emarginate; valves inflated but not highly so, 5–7 mm. long, 4–5 mm. broad,

rather loosely stellate-pubescent; replum oblong or slightly broader, obtuse at apex, 2–3 mm. long; style 4–5 mm. long; ovules 2 on each side of replum; seeds orbicular, marginless, 1–2 in each loculus, about 2 mm. broad.—Ann. Mo. Bot. Gard. **5**: 146 (1918).—COLORADO: Kremmling, Grand Co., June, 1907, *Osterhout 3477* (NY ISOTYPE 2 sheets); Sulphur Springs, July, 1907, *F. E. Clements* (NY).

This species is very closely related to *P. vitulifera*, differing only in a few characters which appear to be of relatively minor importance. *P. Osterhoutii* has more slender nearly entire basal leaves which are acute instead of obtuse as in *P. vitulifera,* more numerous stems and a pendant instead of erect silique. The distinctness of the entity as a species must remain in doubt at present. Certainly a larger series of specimens together with accurate field data are needed to establish the range of variability and precise relationships of this unit. Its known range is entirely in north-central Colorado.

13. P. ACUTIFOLIA Rydberg. Perennial, caespitose, silvery stellate-pubescent throughout, stellae with branched rays; stems several to numerous, decumbent, simple, slender, 5–10 cm. long including fruiting raceme; basal leaves oblanceolate or broader, acute, entire or with one or two broad teeth, 2–3.5 cm. long, 5–10 mm. wide, blades sometimes triangular; cauline few, oblanceolate, entire, acute, 1–1.5 cm. long, 2–4 mm. wide; inflorescence congested, elongating moderately in fruit; sepals linear, 5–7 mm. long, 1 mm. wide; petals yellow, spatulate, often somewhat truncate at apex, 8–10 mm. long, 2–3 mm. wide; pedicels spreading, somewhat sigmoid, 5–8 mm. long; siliques erect, didymous, inflated, slightly cordate at base or nearly obtuse, apical sinus broad and deep; valves suborbicular, 4–5 mm. wide, 6–8 mm. high; replum obovate to slightly longer, obtuse at apex, rarely somewhat constricted toward base, about 3 mm. long, about 1.5 mm. wide; style 5–7 mm. long; ovules 2 on each side of replum; seeds orbicular, brown, only slightly flattened, about 2 mm. broad, 1–2 in each loculus.—Bull. Torr. Bot. Club. **18**: 279 (1901); Rydb., Fl. Colo. 154 (1906) in part; Fl. Rky. Mts. Adj. Pl. 331 (1917) in part; Payson in Ann. Mo. Bot. Gard. **5**: 145 (1918). *P. floribunda* Nelson, Coulter & Nelson Man. Cent. Rky. Mts., 218 (1909) in part.—COLORADO: Grand Junction, Mesa Co., June, 1892, *A. Eastwood* (NY TYPE); South Park, *Wolf & Rothrock 642* (G); Steamboat Springs, Routt Co., July, 1903, *Goodding 1623* (G, NY, US); Ruxton Ridge, Pikes Peak, July, 1901, *F. E. & E. S. Clements 97* (G, NY, US); 10 mi. east of Sapinero, Gunnison Co., May, 1938, *Rollins 2106* (G, R); 5 mi. east of Parlin, Gunnison Co., May, 1938, *Rollins 2088* (G, R); Caldwell Cr., Rio Grande Nat. Forest, Mineral Co., June, 1911, *Murdoch 4542* (NY).

P. acutifolia belongs to the *floribunda-Osterhoutii-vitulifera* group, but differs from all in having smaller entire acute leaves, slender short

stems and an obovate unconstricted replum. Of this group, *P. floribunda* stands closest to *P. acutifolia* and it is quite possible that further investigation will show them to be varieties or phases of a single species. More field-work in the area where these species occur will be necessary before the case can be fully clarified. At present it seems that the dissected basal leaves, descending or obliquely spreading pedicels, greater size and linear-oblong constricted replum of *P. floribunda* are sufficient to distinguish it from its near relative. *P. acutifolia* is found at middle elevations in the central Rocky Mountains of Colorado and is known to be particularly abundant in the Gunnison Basin.

14. P. FLORIBUNDA Rydberg. Perennial, caespitose, silvery stellate-pubescent throughout, stellae with branched rays; stems numerous, simple, arising laterally, decumbent or erect, 1–2 dm. long including the fruiting raceme; radical leaves broadly oblanceolate, pinnatifid or merely dentate, rarely almost entire, 4–8 cm. long, 1–2 cm. wide, terminal lobe acute or obtuse but not rounded, petiole usually winged; cauline spatulate to linear-oblanceolate, acute, entire or rarely few-toothed, 1–3 cm. long, 3–6 mm. wide; inflorescence loosely racemose, greatly elongating in fruit; sepals linear-oblong, 5–7 mm. long, 1–2 mm. wide; petals yellow, spatulate, 9–11 mm. long, about 3 mm. wide; pedicels spreading or somewhat recurved, usually sigmoid, slender, 6–12 mm. long; siliques erect divergent or nearly pendant, didymous, inflated but not greatly so, obtuse or slightly cordate at base, deeply and broadly notched above, valves 4–6 mm. high, 3–5 mm. wide; replum linear-oblong, constricted, 2.5–4 mm. long, less than 1 mm. wide, obtuse at apex, ovules 2 on each side; style 5–8 mm. long; seeds brown, orbicular, about 2 mm. broad, marginless, 1–2 in each loculus.—Bull. Torr. Bot. Club **18**: 279 (1901); Fl. Colo. 154 (1906) in part; Coulter & Nelson, Man. Cent. Rky. Mts. 218 (1909) in part; Rydb., Fl. Rky. Mts. Adj. Pl. 330 (1917); Payson in Ann. Mo. Bot. Gard. **5**: 146 (1918).—COLORADO: west slope LaVeta Pass, Costilla Co., *McKelvey 4787 & 4789* (G); *Bethel, Willey & Clokey 4130* (Cl, G); Sangre de Cristo Creek, July, 1900, *Rydberg & Vreeland 6135* (NY TYPE); *Rydberg & Vreeland 6136* (NY); Cimarron, Gunnison Co., June, 1901, *Baker 38* (G, NY, US); 3 mi. east of Sapinero, Gunnison Co., May, 1938, *Rollins 2108* (G, R); Wolcott, July, 1898, *Shear & Bessey 5295* (NY, US); Glenwood Springs, Garfield Co., June, 1920, *Osterhout* (Cl); Ruxton, Pikes Peak, 1896, *Clements 160* (NY); Bostwick Park, Montrose Co., Aug., 1937, *Rollins 1983* (G, R); July, 1917, *Payson* (US); Ridgway, Ouray Co., June, 1924, *E. B. & L. B. Payson 3832* (G); 3 mi. ne. of Cedaredge, Delta Co., May, 1938, *Rollins 2150* (G, R); 10 mi. n. of Mesa, Mesa Co., May, 1938, *Rollins 2194* (G, R); near Mesa, Mesa Co., May, 1938, *Rollins 2197* (G, R). NEW MEXICO: 10 miles east of Taos, Taos Co., July, 1938, *Rollins & Chambers 2414* (G, R).

P. floribunda is not only more robust than its immediate relatives, but differs from them markedly on characters of the fruits, pedicels and radical leaves. The relationships of this species have been discussed above and need not be stressed further. It is believed that the collection above cited from New Mexico represents the first record of this species from that state.

Explanation of Plate 556

Physaria condensata, n. sp.: fig. 1, plant, × 1; fig. 9, replum, × 2½; fig. 10, silique, × 2½; from *Rollins 2385*.
P. brassicoides Rydb.: fig. 2, silique, × 1½; fig. 3, replum, × 2½; from *Rydberg 24*.
P. acutifolia Rydb.: fig. 4, silique, × 1½; fig. 5, replum, × 2½; from *Eastwood* in 1892.
P. didymocarpa (Hook.) Gray: fig. 6, replum, × 2½; from *Macoun 89*.
P. vitulifera Rydb.: fig. 7, replum, × 2½; fig. 8, silique, × 1½; from *Rydberg*, Aug. 26, 1895.
P. floribunda Rydb.: fig. 11, silique, × 1½; fig. 12, replum, × 2½; from *Rydberg* and *Vreeland 6136*.
P. Osterhoutii Pays.: fig. 13, replum, × 2½; fig. 14, silique, × 1½; from *Osterhout 3477*.
P. Chambersii, n. sp.: fig. 15, replum, × 2½; fig. 16, silique, × 1½; from *Rollins* and *Chambers 2502*.
P. Chambersii Rollins, var. membranacea, n. var.: fig. 17, silique, × 1½; fig. 18, replum, × 2½; from *Rollins* and *Chambers 2448*.
P. australis (Payson) n. comb.: fig. 19, silique, × 1½; fig. 20, replum, × 2½; from *Rollins 1653*.
P. Newberryi Gray: fig. 21, silique, × 1½; fig. 22, replum, × 2½; from *Osterhout 7000*.
P. alpestris Suksdorf: fig. 23, replum, × 2½; fig. 24, silique, × 1½; from *Thompson 8708*.
P. Geyeri (Hook.) Gray: fig. 25, replum, × 2½; fig. 26, silique, × 1½; from *Henderson 2384*.
P. oregona Wats.: fig. 27, silique, × 1½; fig. 28, replum, × 2½; from *Cusick 1895*.

III. THE VARIETIES OF CONVOLVULUS SPITHAMAEUS AND OF C. SEPIUM

R. M. Tryon, Jr.

(Plates 557 and 558)

Plant erect; flowers usually 1–2, rarely 3–4, white; basal leaves not more than one-half as long as some of the upper leaves, often greatly reduced; petioles not more than one-half as long as the blade, usually not more than one-fourth as long. . . . . *C. spithamaeus.*
Plant extensively twining or trailing; flowers several in mature specimens, more than 4, white or pink; basal leaves only slightly reduced; petioles more than one-half as long as the blade . . . . . *C. sepium.*

C. SPITHAMAEUS L.

Plant pubescent or glabrate, short, compact, the tip not prolonged; leaves usually truncate, rounded or auricled at the base, sometimes sagittate; petiole of the first leaf above the uppermost flower not more than one-fourth as long as the blade.....*C. spithamaeus* (typical).
Plant densely pubescent, tall, the tip prolonged; leaves sagittate; petiole of the first leaf above the uppermost flower about one-half as long as the blade.....var. *Catesbeianus*.

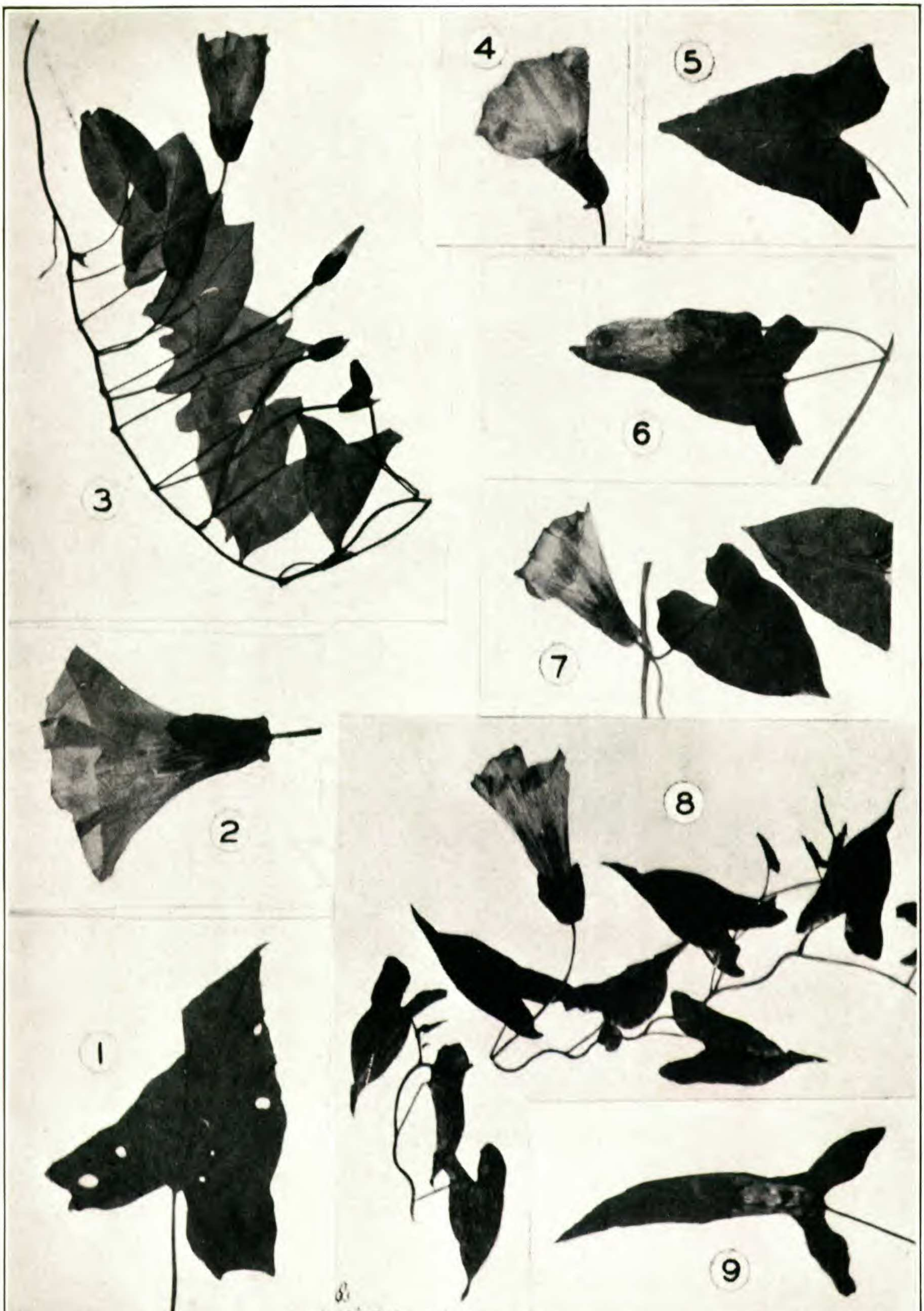
CONVOLVULUS SPITHAMAEUS L., Sp. Pl. 158 (1753) (typical).[1] PLATE 557, FIGS. 1, 2. *Convolvulus stans* Michx., Fl. Bor.-Am. **2**: 136 (1803). *Calystegia spithamaea* (L.) Pursh, Fl. Am. Sept. **1**: 143 (1814). *Volvulus spithamineus* O. Ktze., Rev. Gen. **2**: 447 (1891). *Convolvulus camporum* Greene, Pittonia **3**: 328 (1898). *Volvulus spithamaeus* (L.) Farwell in Am. Midl. Nat. **9**: 274 (1925). *Volvulus spithamaeus* (L.) Farwell var. *stans* (Michx.) Farwell in Am. Midl. Nat. **9**: 274 (1925). *Convolvulus spithamaeus* L. var. *stans* (Michx.) Fogelberg in Trans. Wis. Acad. Sci. **30**: 24 (1937).

The type specimen of *C. spithamaeus* is pubescent, erect, short and compact, the leaves slightly rounded at the base or auricled, the petiole of the first leaf above the uppermost flower not more than one-fourth as long as the blade. This description must be extended to include several minor variations: plant densely pubescent to glabrate, erect, short and compact or sometimes tall; the leaves about 2–6 cm. long, 1–2.5 cm. wide, tapering, rounded, auricled or sagittate at the base; petiole of the first leaf above the uppermost flower 0.2–1.5 cm. long, usually not more than one-fourth as long as the blade, rarely nearly one-third as long.

Southwestern Quebec to Ontario and Minnesota, south to Iowa, Illinois, Pennsylvania and Maryland and in the mountains to West Virginia and Virginia. Representative specimens: QUEBEC: Hull, June 12, 1925, *Rolland-Germain*, no. 19,308. MAINE: Limingston, York Co., Aug. 29, 1916, *Fernald, Long & Norton*, no. 14,414. NEW HAMPSHIRE: Merrimack, Hillsboro Co., June 19, 1918, *C. F. Batchelder*. MASSACHUSETTS: Dunstable, Middlesex Co., June 9, 1928, *Bill, Grigg & Sanford*. CONNECTICUT: Southbury, New Haven Co., June 9, 1906, *G. H. Bartlett*, no. 1,236. NEW YORK: Glenmont, Albany Co., June 14, 1923, *House*, no. 9,331. NEW JERSEY: Riddleton, June 14,

[1] Index Kewensis **3**: 236 (1894) gives several combinations under *Milhania*, a genus taken from Necker by Rafinesque and applied by him to *Calystegia* of R. Brown. The combinations are credited to Rafinesque, Fl. Tell. **4**: 71 (1838) but he actually did not make any combinations under *Milhania*. He probably made the combinations under "*Calistegia*" R. Br. but since he also mentions *Convolvulus*, and says only "*C. sepium*" etc., and since all except three of his own names are without basinym, reference or description, all of the names are ignored.

CONVOLVULUS SPITHAMAEUS: FIG. 1, type, × 2/3; FIG. 2, plant, × ½, from Ontario.
C. SPITHAMAEUS, var. CATESBEIANUS: FIG. 3, type, × ½.



CONVOLVULUS SEPIUM: FIG. 7, leaf and flower, × ⅓, from England.
C. SEPIUM, var. COMMUNIS: FIGS. 1 and 2, leaf and flower, × ½, from TYPE.
C. SEPIUM, var. AMERICANUS: FIG. 3, plant, × ⅓.
C. SEPIUM, var. FRATERNIFLORUS: FIGS. 4 and 5, leaf and flower, × ⅓, from North Dakota; FIG. 6, leaf and flower, × ⅓, from Missouri (TOPOTYPE).
C. SEPIUM, var. REPENS: FIG. 8, TYPE, × ½.
C. SEPIUM, var. REPENS, forma NASHII: FIG. 9, leaf, × ¾.

1895, *C. D. Lippincott.* PENNSYLVANIA: Frazer, Chester Co., June 18, 1910, *E. B. Bartram.* MARYLAND: Chevy Chase, May 27, 1905, *A. Chase*, no. 2,846. DISTRICT OF COLUMBIA: Washington, June 4, 1882, *L. F. Ward.* WEST VIRGINIA: Wardensville, Hardy Co., July 10, 1932, *Hunnewell*, no. 12,417. VIRGINIA: Warm Spring Mt., Batte Co., July 6, 1933, *Hunnewell*, no. 12,916. ONTARIO: Tobermory, June 24, 1934, *Krotkov*, no. 9,340. MICHIGAN: Norway, Dickinson Co., July 8, 1934, *Fernald & Pease*, no. 3,485. KENTUCKY: Fleming Co., June 4, 1938, *E. L. Braun.* WISCONSIN: Minong, Washburn Co., June 19, 1929, *Fassett*, no. 8,635. ILLINOIS: Dear Park, La Salle Co., June 1–7, 1909, *Greenman, Lansing & Dixon*, no. 138. MINNESOTA: North Lake, Cook Co., July 3, 1917, *Lange*, no. 12.

C. SPITHAMAEUS L. var. **Catesbeianus** (Pursh), n. comb. PLATE 557, FIG. 3. *Calystegia Catesbeiana* Pursh, Fl. Am. Sept. **2**: 729 (1814). *Convolvulus Catesbeianus* (Pursh) Elliot, Sketch **1**: 255 (1817). *Convolvulus Catesbei* Spreng., Syst. **1**: 603 (1825). *Convolvulus sepium* L. var. *Catesbeianus* (Pursh) Fernald in RHODORA **37**: 439 (1935), as to name-bringing synonym.—Plant densely pubescent, tall, the tip prolonged; leaves 3–6 cm. long, 2–3 cm. wide, sagittate; petiole of the first leaf above the uppermost flower 1–3 cm. long, at least one-third as long as the blade.—In the mountains from Virginia to "Carolina," Georgia and Alabama. Representative specimens: VIRGINIA: Holston River near Add Wolf, Smyth Co., June 15, 1892, *J. K. Small;* Bedford Co., June 19, 1871, *A. H. Curtiss.* GEORGIA: Stone Mt., May 14, 1901, *A. H. Curtiss*, no. 6,784. ALABAMA: Auburn, Lee Co., April 17, 1897, *Earle & Baker.*

The description has been drawn from a photograph of the type specimen secured by Prof. Fernald through the kindness of Dr. Nicholas Polunin. There has been some confusion in the application of Pursh's name but a study of the type clearly shows that it belongs under *C. spithamaeus* rather than under *C. sepium*, where it was formerly placed.

Synonyms of an intermediate between *C. spithamaeus* and var. *Catesbeianus* are: *Calystegia tomentosa* Pursh, Fl. Am. Sept. **1**: 143 (1814). *Convolvulus stans* sensu Wherry in Torreya **29**: 105 (1929), not Michx. *Convolvulus Purshianus* Wherry in Proc. Pa. Acad. Sci. **7**: 163 (1933).

This species, although admittedly variable, has been commonly considered to have no segregates. Pursh separated a *Calystegia tomentosa* but he was not followed by later authors. Greene in 1898 described a *Convolvulus camporum* from the Middle West but his description fits typical *Convolvulus spithamaeus* perfectly and it is not clear why he thought his material was distinct. Wherry in 1929

revived Michaux's *Convolvulus stans*, described from near Lake Champlain, to represent material he collected on shale-barrens in Pennsylvania. Later, after collecting *Convolvulus spithamaeus* near Montreal and recognizing that the northern plant was "merely a hairy extreme of *C. spithamaeus*" and not identical with his Pennsylvania material, he described the la ter as *Convolvulus Purshianus*, based on *Calystegia tomentosa* Pursh. This is an intermediate between typical *Convolvulus spithamaeus* and var. *Catesbeianus*.

In 1925 Farwell recognized *Convolvulus stans* Michx. as a variety under *Volvulus spithamaeus* and in 1937 Fogelberg recognized it under *Convolvulus spithamaeus*. The bulk of *Convolvulus spithamaeus* may be roughly divided into two groups: one very pubescent with sagittate leaves (this is Michaux's plant which he described as "totus candi-candi-subtomentosus: foliis . . . subcordato-ovalibus . . ."); the other less pubescent, with tapering, rounded or auricled leaf-bases. The first (PLATE 557, FIG. 2) is the common northern form, from Quebec to Minnesota, extending southward in New York and Pennsylvania in the mountains; the second (PLATE 557, FIG. 1) is the common form in Iowa, Illinois, Indiana, Ohio, New York, Pennsylvania and the seaboard states. However, because there is no good correlation between leaf-shape and pubescence and because the ranges overlap a great deal, there is no reasonable basis on which to separate these two variations.

However, var. *Catesbeianus* is an apparently overlooked southern series of *Convolvulus spithamaeus*, extending from Virginia to Alabama along the Appalachian System, which, varying only slightly from the typical form in Pennsylvania, reaches an extreme in Georgia and Alabama.

C. SEPIUM L.

This species is quite variable in leaf-shape, flower-color and pubescence and, although good technical characters have been sought as a basis of separation, none have been found, and it is necessary to fall back on vegetative characters and flower-color to segregate several fairly good geographical varieties.

Leaves hastate, the blade proper usually more than one-half as broad as long, or essentially sagittate; basal lobes angled.
Leaves essentially sagittate; peduncles about twice as long as the petioles, often exceeding the leaves . . . . . *C. sepium* (typical).
Leaves hastate; peduncles usually longer than the petioles but not exceeding the leaves.

Corolla pink, plant essentially glabrous.....var. *communis.*
Corolla white, plant glabrous or pubescent.....var. *fraterniflorus.*
Leaves usually sagittate, or if hastate the blade proper less than one-half as broad as long; basal lobes rounded or slightly pointed.
Corolla pink; peduncles often exceeding the leaves.....var. *americanus.*
Corolla white, rarely tinged with pink on the margin; peduncles usually shorter than the leaves.
Leaf-blade not conspicuously narrow, mostly glabrate.....var. *repens.*
Leaf-blade very narrow, mostly densely pubescent..var. *repens* f. *Nashii.*

CONVOLVULUS SEPIUM L., Sp. Pl. 143 (1753) (typical). PLATE 558, FIG. 7. *Calystegia sepium* (L.) R. Br., Fl. Nov. Holl. 483 (1810). *Volvulus sepium* (L.) Junger in Oest. Bot. Zeitschr. **41**: 133 (1891).—Plant essentially glabrous; leaves about 4–10 cm. long, 3.5–7 cm. wide, hastate-sagittate or sagittate, with the basal lobes angled; corolla white; peduncles 3–7 cm. long, about twice as long as the petioles, often exceeding the leaves.—Introduced sparingly from Europe. Representative specimens: GERMANY: Regensburg, Bavaria, July 1906, *Ig. Familler.* ITALY: Venitia, June 1911, *A. Beguinot*, no. 1,728. NEWFOUNDLAND: St. Johns, 1928, *A. M. Ayre.* NOVA SCOTIA: Yarmouth, Yarmouth Co., July 24, 1920, *Long & Linder*, no. 22,326. NEW BRUNSWICK: Ingleside, Kings Co., Aug. 8, 1909, *Fernald.*

Var. **communis,** n. var., corolla rosea; folia hastata, basi lobis angularis; planta prope glabra. TAB. 558, FIG. 1, 2. *Calystegia Maximilliana* Nees in Neuwied, Riese Nord. Am. **2**: 443 (1841) probably belongs here. *Convolvulus sepium* L. var. *americanus* sensu authors, not Sims.—Plant essentially glabrous; leaves about 5–10 cm. long, 2–5 cm. wide, hastate, the basal lobes angled; corolla pink; peduncles 4–12 cm. long, usually exceeding the petioles but rarely the leaves.—Southern Quebec south to Virginia and sparingly to Florida, west to Minnesota, Oregon and Washington. This is the common plant throughout the northeastern United States. Representative specimens: QUEBEC: Bonaventure River, Gaspé Co., Aug. 14, 1930, *Victorin, Germain & Jacques*, no. 33,752. MAINE: Frankfort, Waldo Co., July 21, 1916, *Fernald & Long*, no. 14,417. NEW HAMPSHIRE: Colebrook, Coos Co., July 17, 1907, *A. H. Moore*, no. 3,927. VERMONT: Manchester, Bennington Co., July 14, 1898, *M. A. Day*, no. 122. MASSACHUSETTS: Dennis, Barnstable Co., Aug. 16, 1919, *Fernald & Long*, no. 19,025. CONNECTICUT: Farmington, Hartford Co., Aug. 2, 1902, *Driggs & Holcomb.* NEW YORK: Oneida Lake, Madison Co., Aug. 18, 1930, *House*, no. 17,891. NEW JERSEY: Merchantville, Camden Co., June 2, 1921, *H. B. Meredith.* PENNSYLVANIA: Wissahickon Creek, Philadelphia Co., June 29, 1924, *H. A. Lang.* FLORIDA: 1844, *F. Rugel*, no. 155. OHIO: Mansfield, June 17, 1895, *Wilkinson*, no. 7,662 (TYPE in the Gray Herbarium). ILLINOIS: Stony Island, Cook Co., June 30, 1914, *H. H. Smith*, no. 5,972. MINNESOTA: Thompson, July 1891, *J. H. Sandberg*, no. 389. OREGON: Salem, Aug. 10, 1920, *J. C. Nelson*, no. 3,296. WASHINGTON: Almota, Aug. 9, 1896, *C. V. Piper.*

Var. AMERICANUS Sims in Bot. Mag. t. 732 (1804). PLATE 558, FIG. 3. *Convolvulus inflatus* Desf., Tabl. l'École Bot. 74 (1804), nomen nudum, identity inferred by reference in Sweet, Hort. Brit. Ed. 2, 370 (1830). *Calystegia inflata* Desf. ex Sweet, Hort. Brit. Ed. 2, 370 (1830) by reference to Bot. Mag. t. 732. *Convolvulus sepium* var. *incarnatus* Sweet, Hort. Brit. Ed. 2, 370 (1830), published in synonymy. *Calystegia riparia* Raf., New Fl. Am. **2**: 29 (1837), ex char. *Convolvulus sepium* L. var. *rosea* Choisy, in DC. Prod. **9**: 433 (1845). *Calystegia sagittata* Turcz. in Bull. Imp. Nat. Soc. Mosc. **22**^{2}: 56 (1849), ex char. *Convolvulus americanus* (Sims) Greene, Pittonia **3**: 328 (1898). *Volvulus sepium* (L.) Junger var. *americanus* (Sims) Farwell in Ann. Rep. Comm. Parks & Boulev. Detroit **11**: 81 (1900). *Calystegia americana* (Sims) Daniels in Univ. Mo. Studies; Sci. Series 1, no. 2, 195 (1907). *Volvulus "inflatus* (Desf.) Dr." [uce], Brit. Pl. List 82 (1928), with *taxonomic* synonym, "*Convolvulus sylvat.*[*icus*] W. & K.," as shown by basinym of *Convolvulus inflatus* Desf. supplied by Druce in Rep. Bot. Exch. Cl. Brit. Isles **8**: 872 (1929). *Convolvulus sepium* L. var. *pubescens* (Gray) Fernald, sensu Fernald in RHODORA **10**: 55 (1908).—Plant usually pubescent or sometimes essentially glabrous; leaves about 4–10 cm. long, 3–6 cm. wide, sagittate, the basal lobes rounded or slightly pointed; corolla pink; peduncles 6–12 cm. long, often exceeding the leaves.—Newfoundland, southern Quebec and Nova Scotia, south along the coast to Maryland and Virginia; also about the Great Lakes in Ontario, Michigan, Ohio, Indiana, Wisconsin and Minnesota. Representative specimens: NEWFOUNDLAND: Southeast Arm, Bonne Bay, Aug. 31, 1910, *Fernald & Wiegand*, no. 3,918. QUEBEC: Anticosti, Aug. 1, 1925, *Victorin, Germain & Marie*, no. 22,046. PRINCE EDWARD ISLAND: Indian River, Prince Co., Aug. 29, 1912, *Fernald, Long & St. John*, no. 7,954. NOVA SCOTIA: Eel Lake, Yarmouth Co., July 27, 1920, *Fernald, Bean & White*, no. 22,323. NEW BRUNSWICK: Bay du Vin Island, Sept. 18, 1913, *Blake*, no. 5,702. MAINE: Roque Bluffs, Washington Co., Aug. 11, 1907, *Cushman & Sanford*, no. 1,640. NEW HAMPSHIRE: Dover, Strafford Co., June 25, 1933, *Hodgdon*, no. 373. VERMONT: Rock Point, Burlington, July 12, 1894, *Eggleston*. MASSACHUSETTS: Oak Bluffs, Marthas' Vineyard, June 29, 1916, *Seymour*, no. 1,322. RHODE ISLAND: Block Island, Newport Co., Aug. 22, 1913, *Fernald, Hunnewell & Long*, no. 10,253. CONNECTICUT: Old Lyme, New London Co., June 13, 1912, *A. E. Blewitt*, no. 1,575. NEW YORK: Southampton, Long Island, Suffolk Co., July 25–Aug. 3, 1920, *H. St. John*, no. 2,887. NEW JERSEY: Milltown, May 1891, *Halsted*, no. 56. PENNSYLVANIA: Tinicum, Delaware Co., June 12, 1899, *A. MacElwee*, no. 526. DELAWARE: Oak Orchard, Sussex Co., Aug. 11, 1934, *Fernald & Long*, no. 4,148. MARYLAND: Havre de Grace, Aug. 3, 1923, *Tidestrom*, no. 11,590. VIRGINIA: Sea beach, Buckroe, May 16, 1912, *Robinson*, no. 357. ONTARIO: Tobermory, Bruce Co., July 3, 1933, *Krotkov*, no. 7,721. OHIO: Huron, Erie Co., Aug. 13, 1896, *E. L. Mosely*. MICHIGAN: Ann Arbor, Washtenaw Co., June

9, 1899, *S. H. Burnham.* INDIANA: East Chicago, Lake Co., June 24, 1920, *Peattie.* MINNESOTA: Swan Lake, Nicollet Co., June 1892, *C. A. Ballard.*

Choisy cited *C. repens* L. as a synonym of his var. *rosea* but this was an error and his varietal name cannot be used for the Linnaean plant. The type of *C. repens* L. is *Clayton*, no. 665, on which is written ". . . flore niveo, margine dilute rubente . . ." This is clearly not the plant which Choisy described with "corolla rosea ampla" and illustrated by reference to Bot. Mag. t. 732. Choisy's name is clearly referable to var. *americanus* Sims, not to *C. repens* L.

Although Sims' name has long been used for the common American plant (var. *communis*) his illustration shows the leaves sagittate, not hastate, and his name must be taken up for the sea-coast plant previously placed under var. *pubescens*.

Var. REPENS (L.) Gray, Syn. Fl. N. Am. **2**[1]: 215 (1878). PLATE 558, FIG. 8. *Convolvulus repens* L., Sp. Pl. 158 (1753). *Calystegia villosa* Raf., Fl. Ludov. (1817), ex char. *Convolvulus lactescens* Gronov. ex Choisy, in DC. Prod. **9**: 433 (1845), published in synonymy. *Calystegia sepium* (L.) R. Br. var. *repens* Gray, Man. Bot. 348 (1848). *Calystegia sepium* (L.) R. Br. var. *pubescens* Gray, Man. Bot. Ed. 5, 376 (1867). *Volvulus sepium* (L.) Junger var. *biangulo-sagittata* O. Ktze., Rev. Gen. **2**: 447 (1891). *Convolvulus sepium* L. var. *pubescens* (Gray) Fernald in RHODORA **10**: 55 (1908), as to name-bringing synonym. *Volvulus sepium* (L.) Junger var. *pubescens* (Gray) Farwell in Am. Midl. Nat. **12**: 130 (1930). *Convolvulus sepium* L. var. *Catesbeianus* (Pursh) Fernald, sensu Fernald in RHODORA **37**: 439 (1935).—Plant pubescent or essentially glabrous; leaves about 5–9 cm. long, 1.5–3 cm. wide, sagittate or sometimes hastate, the basal lobes rounded; corolla white or sometimes with a pink margin; peduncles usually 5–6 cm. long, not exceeding the leaves.—Primarily a Coastal Plain variety from Rhode Island to Florida, Alabama, Louisiana and Missouri, but also in the mountains of West Virginia. Representative specimens: RHODE ISLAND: Block Island, Newport Co., Sept. 14, 1913, *Fernald, Long & G. S. Torrey.* DISTRICT OF COLUMBIA: June 25, 1896, *E. S. Steele.* WEST VIRGINIA: Lost River, Hardy Co., Aug. 18, 1931, *E. L. Core*, no. 3,727. VIRGINIA: Jordan Point, Prince George Co., Aug. 16, 1938, *Fernald & Long*, no. 9,129, Sept. 16, 1938, no. 9,410. SOUTH CAROLINA: Morris Island, 1864, *Grosvenor.* GEORGIA: Darien, McIntosh Co., July 25, 1927, *Wiegand & Manning*, no. 2,639. FLORIDA: Jacksonville, April, *Curtiss*, no. 2,172. MISSOURI: St. Louis Co., July 1875, *H. Eggert.*

An extreme form in Florida which extends northward to South Carolina is f. **Nashii** (House), n. comb. (*Convolvulus Nashii* House in Muhl. **5**: 66 (1909)) with the leaf-blade very narrow, about 1 cm.

wide, usually densely pubescent and the basal lobes widely spreading. PLATE 558, FIG. 9. Representative specimens: FLORIDA: Eustis, Lake Co., March 12–31, 1894, *Nash*, no. 44, May 1–15, no. 609 (TYPE NUMBER).

Var. *pubescens* Gray was not clearly defined when published and the name has been used for the northern sea-coast plant (var. *americanus*). There is no specimen in the Gray Herbarium labeled var. *pubescens* by Gray but he placed his var. *pubescens* in synonymy under var. *repens* in the Synoptical Flora and, although his definition of var. *repens* was broader than that of Linnaeus, an examination of the specimens labeled var. *repens* by him shows them all to be the southern plant described by Linnaeus. Since he had these specimens before him when he reduced var. *pubescens* to a synonym of var. *repens*, it is only logical to consider the former name as a synonym of the latter.

The type of *Volvulus sepium* (L.) Junger var. *biangulo-sagittata* O. Ktze. has been examined, through the courtesy of Dr. Gleason, and clearly belongs under var. *repens* (L.) Gray.

Var. FRATERNIFLORUS Mack. & Bush, Man. Fl. Jackson Co., Mo. 153 (1902). PLATE 558, FIGS. 4–6. *Convolvulus fraterniflorus* (Mack. & Bush) Mack. & Bush in Rep. Mo. Bot. Gard. **16**: 104 (1905).—Plant pubescent or essentially glabrous; leaves about 3–9 cm. long, 2–5 cm. wide, hastate, the basal lobes angled; corolla white; peduncles about 4–8 cm. long, usually exceeding the petioles but rarely the leaves.—Illinois to Montana, south to Arkansas and New Mexico. Representative specimens: ILLINOIS: Peoria, July 1903, *F. E. McDonald*. IOWA: Ames, July 1909, *Campbell*, no. 43. MISSOURI: Martin City, June 28, 1905, *Bush*, no. 3,037 (type locality). ARKANSAS: northwestern Ark., July, *F. L. Hawey*, no. 119. NORTH DAKOTA: Fargo, Aug. 23, 1901, *Waldron & Manns*. KANSAS: Rieley Co., June 18, 1895, *J. B. Norton*, no. 353. MONTANA: Gallatin Co., Aug. 5, 1901, *W. W. Jones*. COLORADO: New Windsor, Weld Co., July 31, 1906, *Osterhout*, no. 3,456. NEW MEXICO: Las Vegas, July 1881, *G. R. Vasey*.

Mackenzie and Bush described var. *fraterniflorus* from Missouri as a pubescent plant with large bracts and usually paired flowers. However, their material is only a small part of a larger, white-flowered series, growing throughout the Prairie and Great Plain regions.

EXPLANATION OF PLATES 557 AND 558

PLATE 557. CONVOLVULUS SPITHAMAEUS L.: FIG. 1, plant, × ⅔, (TYPE); FIG. 2, plant, × ½ from Ontario.

Var. CATESBEIANUS (Pursh) Tryon: FIG. 3, plant, × ½ (TYPE).

PLATE 558. CONVOLVULUS SEPIUM L. (typical): FIG. 7, leaf and flower, × ⅓, from England.

Var. COMMUNIS Tryon: FIGS. 1–2, leaf and flower, × ½, from TYPE.
Var. AMERICANUS Sims: FIG. 3, plant, × ⅓.
Var. FRATERNIFLORUS Mack. & Bush. FIGS. 4–6: FIGS. 4–5, leaf and flower, × ⅓, from Fargo, North Dakota; FIG. 6, leaf and flower, × ⅓, from Martin City, Missouri (TYPE LOCALITY).
Var. REPENS (L.) Gray: FIG. 8, plant, × ½ (TYPE).
Var. REPENS (L.) Gray f. NASHII (House) Tryon: FIG. 9, leaf, × ¾.

IV. NEW SPECIES, VARIETIES AND TRANSFERS

M. L. FERNALD

(Plates 559–569)

IN THE COURSE of studies on the flora of the northeastern United States and adjacent Canada and Newfoundland numerous items have accumulated which need discussion or clarification. In so far as they are in form for publication they are here presented.

CYPERUS DIANDRUS Torr., forma **elongatus** (Britton), comb. nov. *C. diandrus*, var. *elongatus* Britton in Bull. Torr. Bot. Cl. xix. 226 (1892).

Typical *Cyperus diandrus* has the spikelets 6–32-flowered and 0.4–1.8 cm. long. Forma *elongatus*, which is scattered throughout the range of the typical form, has them much elongate (as in many species of the tribe), 40–50-flowered and 2–2.5 cm. long.

ARUNCUS **dioicus** (Walt.) comb. nov. *Actaea dioica* Walt. Fl. Carol. 152 (1788). *Aruncus allegheniensis* Rydb. in N. Am. Fl. xxii³. 256 (1908); Fernald in RHODORA, xxxviii. 180, t. 416, figs. 1, 2, 5 and 8 (1936).

A. DIOICUS, var. **pubescens** (Rydb.) comb. nov. *A. pubescens* Rydb. in N. Am. Fl. xxii³. 256 (1908). *A. allegheniensis* Rydb., var. *pubescens* (Rydb.) Fernald in RHODORA, xxxviii. 179, t. 416, fig. 4 (1936).

In 1936 I published photographs showing how the eastern North American *Aruncus* differs in details of flowers and fruits from the Old World *A. sylvester* Kostel. (1844); and I took up the name *A. allegheniensis* Rydb. (1908) for our plant. I then overlooked, as had Rydberg, the very early description of the Carolinian plant by Walter (June, 1788). *Aruncus* as a genus, rests upon the Old World *Spiraea Aruncus* L. and under the latter name the eastern American plant was known until the recent general acceptance of the genus *Aruncus*. *Aruncus* of the *Rosaceae* superficially resembles *Astilbe* of the *Saxifragaceae* and the two are frequently misidentified; *Astilbe* has perfect flowers,

Aruncus is dioecious. Walter's *Actaea dioica* was unusually well described:

> *dioica* 3. floribus paniculatis; corollis 4 ad 6 petalis viridescentibus; pericarpiis 5 ad 15 monospermis; foliis triternatis, foliolis obovatis lobatis integrisque; caulibus suffruticosis.

In February, 1839, Asa Gray, studying Walter's herbarium, made the memorandum: "*Actaea dioica!* = Spiraea Aruncus." Gray, maintaining our plant as *Spiraea Aruncus* L. and, subsequently, following the sensible, therefore discarded Kew rule, called it *Aruncus sylvester.* It is natural, therefore, that in Gray's own work Walter's name got overlooked. Some European and Asiatic botanists treat *Aruncus* as a variable circumboreal monotype. It should be noted that for the aggregate species of such authors the name *Aruncus dioicus*, based on a Walter name of 1788, has priority over all others yet brought forward.

ILEX MONTANA AND I. DUBIA (PLATE 559). In 1848, in the 1st edition of his Manual, Asa Gray published the new species *Ilex montana* Torr. & Gray in Gray, Man. 276 (1848). There already existed a *Prinos montanus* Swartz, Prodr. 58 (1788) and Gray, in 1856, thinking apparently of the specific rather than the generic name, changed his *I. montana* to *I. monticola* Gray, Man. ed. 2: 264 (1856), a substitute for "I. montàna, *ed.* 1, not Prinos montanus, *Sw.*" Of course, by present rules of nomenclature the original *Ilex montana* Torr. & Gray (1848) was the valid name, since there existed no other identical combination. But the suggestion once started, that there was perhaps something not quite regular in the nomenclatural situation, error after error has followed. It was not until thirteen years after the first and wholly correct publication of the combination *Ilex montana* (1848) that *Prinos montanus* Sw. was transferred to *Ilex*, and then by the barest technicality: "ILEX MONTANA, Griseb.—Syn. *Prinos montanus* et *P. sideroxyloides*, Sw.," published by Grisebach in Mem. Am. Acad. n. s. viii. (Plantae Wrightianae), 171 (1861); by a bare technicality because *P. montanus* and *P. sideroxyloides* are not conspecific. Nevertheless, following the example of Asa Gray, who threw aside the wholly right *I. montana* (1848) on account of Swartz's *Prinos montanus*, succeeding authors have mostly assumed that the Grisebach binomial of 1861 has priority over that of Torrey & Gray in 1848! In 1890, to be sure, Britton used the name correctly when he published *I. montana* T. & G., var. *mollis* (Gray) Britton in Bull. Torr. Bot. Cl. xvii. 313 (1890), based on *I. mollis* Gray (1867). For some reason, however, he

promptly abandoned the correct specific name and in 1894, in Mem. Torr. Bot. Cl. v. 217 (1894), took up *I. monticola* Gray (1856) with the synonym "*I. montana* T. & G.; A. Gray, Man. 276 (1848), not Griseb."; but in 1913 he returned, correctly it seems to me, to *I. montana*, in Ill. Fl. ed. 2, ii. 488 (1913). Trelease and some other American authors have also assumed the priority of Grisebach's combination. *Index Kewensis* did not catch the original *I. montana* T. & G. (1848) and gave only that of Grisebach (1861); furthermore it listed as maintained both *I. monticola* Tul. (1857) and *I. monticola* Gray, but started the latter from Gray, Man. ed. 5: 306 (1867), instead of from ed. 2: 264 (1856). Thus, if *Index Kewensis* is taken as the guide in these instances, both *I. montana* Griseb. and *I. monticola* Tul. have right-of-way, whereas they are both later homonyms. For the large-leaved and large-fruited shrub of the Blue Ridge and the Alleghenies the name *I. montana* Torr. & Gray is apparently correct.

Another series of errors started with the citation in the original publication of *Ilex mollis* Gray of the synonym "P[rinos]. ambiguus *Pursh*, not *Michx.*"; and by Trelease in Gray's Synoptical Flora, i. 390, of the citation under the same species, of *I. dubia* (G. Don) BSP., based on *P. dubius* G. Don. The citation of *P. ambiguus* would now be more correctly SENSU Pursh, not Michx. As to *P. dubius* the case seems in some ways clear; in others it is both dubious and ambiguous. The name *Prinos ambiguus* started in Michaux, Fl. Bor.-Am. ii. 236 (1803), for the small-leaved southern shrub, called *I. ambigua* (Michx.) Chapm. by Trelease and by Small, although, as shown by Rehder in Journ. Arn. Arboret. iii. 214 (1922), *I. ambigua* (Michx.) Chapm. must give way to *I. caroliniana* (Walt.) Trel. in Trans. Acad. Sci. St. Louis, v. 347 (1889), which rests on *Cassine caroliniana* Walt. Fl. Carol. 242 (1788). Michaux, who suggested similarity of his species to *Cassine caroliniana* Walt., described it as follows:

> AMBIGUUS. P. foliis ovalibus, utrinque acuminatis; pedicellis masc. 1-floris, ad imos ramunculos numerose congestis; foem. solitariis: florum partitione quaternaria.
> *OBS.* Interdum florum partitio quinaria; tunc videtur CASSINE *caroliniana*. WALTERI. Certo tamen *P. verticillati* LINN. congener.
> *HAB.* in Carolina.

Pursh somewhat altered the description to cover a different species and extended the range north to New Jersey, where *Prinos ambiguus* Michaux is unknown. Pursh's account was as follows:

ambiguus. 2. P. foliis deciduis ovalibus utrinque acuminatis mucronato-serrulatis subtus pubescentibus, floribus 4–5-fidis, masculis ad imos ramulos congestis, foemineis solitariis.—*Mich. fl. amer.* 2. *p.* 236.
Cassine caroliniana. *Walt. fl. car.* 242.
In sandy wet woods and on the borders of swamps: New Jersey to Carolina. ♄ . July, Aug. *v. v.* Flowers white; berries red, larger than No. 1. [*P. verticillatus.*][1]

Obviously Pursh added something quite extraneous to the original *Prinos ambiguus* Michaux; but he was not intentionally publishing a new species. He definitely ascribed it to Michaux, and the Pursh amplification should, as already stated, be cited: *P. ambiguus* SENSU Pursh, not Michx. George Don, presumably not knowing either the shrub of Michaux or of Pursh, literally translated into English the account of Pursh, even to "in sandy woods, and on the borders of swamps, from New Jersey to Carolina," and appropriately renamed this shrub, which he probably did not know, *Prinos dubius* G. Don, Gen. Syst. Gard. Bot. ii. 20 (1832). In 1888, Britton, Stern & Poggenburg transferred *P. dubius* to *Ilex,* without a word of discussion, and with as little bibliographic citation as was given by Grisebach in publishing his *I. montana* (Sw.) Griseb., barely enough, presupposing a foregiving botanical public, to get by: Ilex "dubia, (Don). (*I. mollis, Gray.*)," BSP., Prelim. Cat. Anthoph. Pteridoph. N. Y. 11 (1888). Shortly thereafter Dr. Britton, rightly as it seems to me, discarded the name *I. dubia* for *I. mollis* and published *I. montana* T. & G., var. *mollis* (Gray) Britton in Bull. Torr. Bot. Cl. xvii. (1890).

Ilex montana (including *I. mollis* and *I. monticola*) is a small tree or large shrub of upland woods along the mountains from western New England and the uplands of New York southward. The range and habitat given by Britton is "Mountain woods, New York and Pennsylvania to Georgia and Alabama. Mountain holly." (Ill. Fl. ed. 2, ii. 489); Small (Man. 815), calling it "Mountain Holly," says, "Woods, especially mountain slopes, Blue Ridge and more northern provinces, Ga. and Ala. to N. Y."; Taylor (Fl. Vic. N. Y.) has it "In mountain woods" and cites New Jersey material only from the upland of Sussex and Morris Counties; House (Annot. List N. Y., 480), correctly taking up *I. montana,* says "In mountainous woods"; and so does Porter (Fl. Penn. 203); and the most northeasterly stations for the species are "on the summit of The Dome and about Plantin Pond, Mt. Wash-

[1] Pursh, Fl. Am. Sept. i. 220 (1814).

ington," Berkshire County, Massachusetts (Hoffmann, Fl. Berks. Co. 296). It, therefore, seemed quite improbable that the shrub described by Pursh from "sandy wet woods and on the borders of swamps: New Jersey to Carolina," and thought by him to be the small-leaved *Prinos ambiguus* of Michaux, could have anything to do with the Large-leaved or Mountain Holly, *Ilex montana* Torr. & Gray, of upland woods of the Blue Ridge and the Alleghenies. It seemed evident that, in taking up in place of the clearly typified *I. montana* the wholly indefinite and heretofore unidentified *I. dubia*, Loesener, Mon. Aquifol. (Nov. Act. Abh. k. Leop.-Carol. Deutsch Akad. Naturforscher, lxxviii), 484 (1901) and those who follow him have not understood what Pursh had before him. Since the fullest representation of Pursh's types is in the remarkable collection which had belonged to Benjamin Smith Barton and then to the American Philosophical Society (the collection now deposited at the Academy of Natural Sciences of Philadelphia), I sought there, with the aid of Dr. Pennell and Mr. Long. The species of *Prinos* treated by Pursh, including the type of his *P. laevigatus* (correctly interpreted) are well accounted for by good specimens with Pursh's own labels. There is, however, nothing called by him *P. ambiguus;* but a very full and beautiful sheet in staminate flower (our FIG. 1) bears in his hand an unpublished new name; and in all details, "foliis deciduis ovalibus utrinque acuminatis mucronato-serrulatis subtus pubescentibus, floribus 4–5-fidis, masculis ad imos ramulos congestis," it beautifully checks with the Pursh diagnosis of *P. ambiguus* sensu Pursh, not Michx. That it truly represents what Pursh described, though no fruit is now preserved, there can be no question. The specimen was from the Bartram Garden, the shrubs originally found by Bartram on the Meherrin River, which he crossed above Emporia in Virginia. Dr. Pennell has most kindly allowed me to reproduce a portion of it, × 1, as PLATE 559, FIG. 1. FIG. 2 shows the under surface of a leaf, × 10, to indicate the pubescence; FIG. 3 is from an isotype, × 1, of *Ilex Amelanchier* M. A. Curtis; FIG. 4, the lower surface, × 10, of a leaf of the latter. That they are the same species is evident. Barton presented a small fragment of the Pursh type to Asa Gray. This fragment, without further elucidation than a note by Gray, "Pursh, Hb. Barton" is mounted beside the isotype of *I. Amelanchier* in the Gray Herbarium and it bears the Synoptical Flora revision-slip marked by Trelease "*Ilex Amelanchier.*" Evidently neither Gray nor Trelease recognized its full significance.

Very briefly the tangled nomenclature of *Ilex montana* and of *I. dubia* follows.

ILEX MONTANA Torr. & Gray in Gray, Man. 276 (1848), not *I. montana* (Sw.) Griseb. (1861). *I. ambigua* sensu Torr. Fl. N. Y. ii. 2 (1843), not *Prinos ambiguus* Michx. (1803), source of the name. *Prinos ambiguus* sensu Wood, Class-Book, pt. ii. 243 (1845), not Michx. (1803), obviously, from the description, based on *Ilex ambigua* sensu Torr., although the latter not cited. *I. monticola* Gray, Man. ed. 2: 264 (1856), illegitimate (substitute) name, not *I. monticola* Tul. (1857). *I. Amelanchier* β. *monticola* Wood, Am. Bot. Fl. 208 (1870), obviously, from the description, based on *I. monticola* Gray, although the latter not cited. *I. dubia*, var. *monticola* (Gray) Loesener, Mon. Aquifol. (Nov. Act. Abh. k. Leop.-Carol. Deutsch Akad. Naturforscher, lxxviii), 485 (1901).

Var. MOLLIS (Gray) Britton in Bull. Torr. Bot. Cl. xvii. 313 (1890). *I. mollis* Gray, Man. ed. 5: 306 (1867) as to type (*Lowrie*) and descr., excl. synonyms. *I. dubia* sensu Trelease ex Loesener in Koehne, Deutsche Dendrol. 371 (1893) and in Loesener, Mon. Aquifol. 484 (1901), not *I. dubia* (G. Don) BSP. (1888). *I. monticola mollis* (Gray) Britton in Mem. Torr. Bot. Cl. v. 217 (1894). *I. dubia*, var. *mollis* (Gray) Loesener, l.c. 486 (1901) and var. *mollis* forma *Grayana* Loesener, l. c. 487 (1901).

Var. **Beadlei** (Ashe), comb. nov. *I. Beadlei* Ashe in Bot. Gaz. xxiv. 377 (1897). *I. dubia*, var. *mollis*, forma *Beadlei* (Ashe) Loesener, l. c. 487 (1901). *I. dubia*, var. *Beadlei* (Ashe) Rehder, Man. Cult. Trees and Shrubs, 546 (1927), wrongly ascribed to Loesener.

Var. **macropoda** (Miq.), comb. nov. *I. macropoda* Miq. Prol. Fl. Jap. in Ann. Mus. Bot. Lugd.-Bat. iii. 105 (1867). *I. dubia*, var. *macropoda* (Miq.) Loesener, l. c. 487 (1901).

Var. **hupehensis** (Loesener), comb. nov. *I. dubia*, var. *Hupehensis* Loesener, l. c. 488 (1901).

I. DUBIA (G. Don) Britton, Stern & Poggenburg, Prelim. Cat. Anthoph. Pteridoph. N. Y. 11 (1888); Trelease ex Loesener in Koehne, Deutsche Dendrol. 371 (1893) as to source of name. *Prinos ambiguus* sensu Pursh, Fl. Am. Sept. i. 220 (1814), not Michx. *P. dubius* G. Don, Gen. Syst. Gard. Bot. ii. 20 (1832), renaming of *P. ambiguus* sensu Pursh, therefore based on the Pursh type. *I. Amelanchier* M. A. Curtis in Chapm. Fl. So. U. S. 270 (1865). *Prinos corymbosus* Pursh "Herb. Barton. mss. ex Sargent," Loesener, Mon. Aquifol. 489 (1901), in synonymy.

The last name, published in synonymy, is similar to but not quite identical with the unpublished trivial "*corymbulosus*," written by Pursh on the label of his material in Barton's herbarium. As already explained, it is evident that, after writing the diagnosis of his new species under the unpublished name, Pursh (or his editors) dropped

the name and erroneously took up *P. ambiguus* Michx. Thus the doubt and ambiguity started and the name given by George Don to the Pursh plant was almost prophetic in its meaning.

PARTHENOCISSUS QUINQUEFOLIA (L.) Planch., forma **hirsuta** (Donn), comb. nov. *Ampelopsis hirsuta* Donn, Hort. Cantab. 166 (1796), *nomen nudum;* Roem. & Schultes, Syst. v. 321 (1819). *Cissus hederacea,* β. *hirsuta* (Donn) Pursh, Fl. Am. Sept. i. 170 (1814). *Quiniaria hirsuta* (Donn) Raf. Am. Man. Grape Vines, 6 (1830). *Ampelopsis quinquefolia,* β. *hirsuta* (Donn) Torr. & Gray, Fl. i. 245 (1838). *P. quinquefolia,* var. β. *hirsuta* (Donn) Planch. in DC. Monogr. v². 449 (1887), erroneously ascribed to Torr. & Gray. *P. hirsuta* (Donn) Small, Fl. Se. U. S. 758 (1903), not Planch. (1900). *Psedera hirsuta* (Donn) Greene, Leafl. Bot. Obs. i. 220 (1906). *Psedera quinquefolia,* var. *hirsuta* (Donn) Rehder in RHODORA, x. 26 (1908).

Although Donn (who did not describe the plant), Roemer & Schultes (who took their description from Pursh), Rafinesque, Small, Greene and Rydberg (in his Flora of Prairies and Plains) maintain, merely because of some pubescence on the foliage, *Parthenocissus hirsuta* as a species, I agree with the conclusion of the late Eugene P. Bicknell: "as to the pubescent . . . plant there seems little reason to doubt that it is merely a condition of the common Virginia creeper."[1] When he transferred it, as a variety, to *Psedera quinquefolia,* as var. *hirsuta,* Rehder gave it a restricted western range, "from Ontario (Dr. Wm. Macoun, orally) through western New England and along the western slope of the Alleghany mountains through New Mexico to Mexico. In the North this variety very rarely flowers and fruits, which suggests that it is not at home there."[2] My own experience and that of some others who have watched the plants indicates that the pubescent form is most apt to be in shadier and damper habitats than the glabrous and more fruitful plant; and Bicknell, in the place cited, went even further, saying: "The leaves of young plants are often very pubescent, and in older plants the lower leaves may be pubescent and the later ones quite glabrous". Bicknell's notes were made on Nantucket Island where the plant is fertile; flowering or fruiting specimens of it are also before me from Vermont, from Martha's Vineyard, from Connecticut and from New York. These are all from near the northeastern limit of the species, and Nantucket and Martha's Vineyard are as far east as any stations known for the glabrous plant, while material in the Gray Herbarium from Kenesaw Mountain, Georgia,

[1] Bicknell in Bull. Torr. Bot. Cl. xl. 607 (1913).
[2] Rehder in RHODORA, x. 26 (1910).

is from well to the southeast of the "western slope of the Alleghany mountains." In other words, the pubescent plant may occur almost anywhere through the range of the glabrous one.

Parthenocissus quinquefolia is essentially a southern species, common in the southern United States and extending northward to southwestern Maine, southern New Hampshire, Vermont, New York, Indiana, Illinois and Iowa. There is no material of it in the Gray Herbarium from Canada, where it is wholly or chiefly replaced by the northern and western *P. vitacea* (Knerr) Hitchc. All material of the genus which I have seen from Quebec, Prince Edward Island, New Brunswick, Nova Scotia and Ontario belongs to the latter species. It is, therefore, important to consider for a moment the facts that the basic *Hedera quinquefolia* L. Sp. Pl. i. 202 (1753) apparently drew its trivial name from *Edera quinquefolia canadensis*, Cornut, Can. Pl. 99, t. 100 (1635) and that by Linnaeus the species was assigned the unequivocal "*Habitat in* Canada." From this habitat one might infer that the Linnean plant was the Canadian *Parthenocissus vitacea*. It should be borne in mind, however, that Linnaeus gave five other references, including Gronovius (who could have had only the southern species) and that his diagnosis was derived from Mitchell; furthermore, the Cornut plate shows an exaggerated number of adhesive disks on the tendril-branches and his description specially mentions them. It is probable, then, that Cornut's plant was wrongly ascribed a Canadian origin. With the vague geographic concepts of his time Cornut included in his book plants of Spain, Greece, India and other Old or New World areas. Unless his descriptions and illustrations are definitely of known Canadian species it is unsafe to assume that they were based on Canadian plants. The name *Parthenocissus quinquefolia* may safely be left to the species with abundant adhesive disks, paniculately clustered cymes with solitary lower branches, and relatively small fruits.

As to the nomenclatural basis of forma *hirsuta*, Pursh, in first describing it, took up the name used without definition by Donn; so did Roemer & Schultes in publishing *Ampelopsis hirsuta*. Donn's name was thus validated and Donn should be cited parenthetically.

PARTHENOCISSUS VITACEA (Knerr) Hitchc., forma **dubia** (Rehder), comb. nov. *P. hirsuta* Graebner in Gartenfl. xlix. 249 (1900), not *P. hirsuta* (Donn) Small (1903), later homonym—see synonymy above. *P. vitacea*, var. *dubia* Rehder in Mitt. Deutsch. Dendr. Ges. xiv. 135

(1905). *Psedera vitacea*, var. *dubia* (Rehder) Rehder in RHODORA, x. 28 (1908).

VITIS LABRUSCA L., forma **alba** (Prince), comb. nov. Var. *alba* Prince, Treatise on the Vine, 181 (1830).

The form with very pale fruit, either white with amber or russet tone or pinkish.

VITIS RUPESTRIS Scheele, forma **dissecta** (Eggert), comb. nov. Var. *dissecta* Eggert ex Bailey in Gray, Syn. Fl. N. Am. i. 422 (1897).

VITIS RIPARIA Michx., var. **syrticola** (Fernald & Wiegand), comb. nov. *V. vulpina*, var. *syrticola* Fernald & Wiegand in RHODORA, XXV. 212 (1923).

The name *Vitis riparia* Michaux, for the common Riverbank or Frost Grape, with long porrect and acuminate leaf-lobes, small acid fruits with a heavy bloom, and very thin diaphragms at the stem-nodes was correctly applied by DeCandolle, Torrey, Torrey & Gray and Emerson, and by Gray (as a species or as *V. cordifolia*, var. *riparia*) in the first five editions of the *Manual*, by Watson in the 6th edition and by Planchon and numerous other students of our grapes. The name *V. vulpina* L., on the other hand, was as regularly misapplied for many years to the southern *V. rotundifolia* Michx. (the Muscadine).

That the name *Vitis vulpina*, like most Linnean names resting partly on material well known to Linnaeus at first hand, partly on literary references and specimens not so clearly understood by him, does not apply to *V. rotundifolia* everyone is now agreed. In recent years, unjustifiably as it will appear, it has been applied to the northern and almost transcontinental and western *V. riparia* Michx. In June, 1893, Professor L. H. Bailey published a letter from the late Dr. N. L. Britton which included the following item on the Linnean herbarium:

> "*Vitis vulpina*, Linn.—Flowering specimens from the Upsala [Sweden] garden and leaves from Kalm. Planchon correctly refers them to the *V. riparia*, Michx., the type of which is in Michaux' herbarium at Paris, and is correctly understood as the common river-bank grape."[1]

That would seem to be conclusive; and Bailey forthwith regularly reduced *Vitis riparia* Michx. to *V. vulpina* L., in Gray's Synoptical Flora and elsewhere. But in 1898 Bailey wrote:

> "Since that time, however, I have myself examined Linnaeus' specimens in London, and find that he had specimens of two species under the name of vulpina. On one sheet are two leaves, one marked *V. vinifera*

[1] Britton as quoted by Bailey in Am. Gard. xiv. 353 (June, 1893).

and the other *V. vulpina*, both in Linnaeus' hand. The former is the wine-grape (*V. vinifera*), and the latter is the river-bank grape (*V. riparia*). Another herbarium sheet, however, has a large flowering specimen, labelled, in Linnaeus' hand, *V. vulpina*, and this is the frost-grape (*V. cordifolia*). It would have been better to have taken this latter specimen as Linnaeus' type, and to have made the name vulpina supplant cordifolia; but since the other disposition has been made of the case, I shall not make the change."[1]

In March, 1934, Bailey quoted his statement just given and added:

"My opinion still holds that the specimen represents the winter grape (*V. cordifolia*) although a new examination of the specimen itself might afford additional clues. . . The Linnaean sheet identified as *cordifolia* is inscribed by Linnaeus with the name *vulpina* and the numeral 4 that refers to the entry in Species Plantarum. Rules of nomenclature adopted since the foregoing publications require, on the face of the record, that *vulpina* supplant *cordifolia*, in which case *riparia* comes up for the plant now known as *vulpina* or frost grape; the net gain would be confusion. But the case is not as simple as this.

As one looks at the Linnaean account in Species Plantarum one is struck by the fact that *Vitis vulpina* is not described, but is attended with the phrase "foliis cordatis dentato-serratis utrinque nudis"; then is cited "Vitis vulpina dicta virginiana nigra" from Plukenet, Almagestum, 1696; apparently Linnaeus took the name *vulpina* from Plukenet. The Latin line precludes *V. Labrusca*, *aestivalis*, and its relatives, and it leaves only the frost grape and winter grape and the muscadine among Virginian species to qualify for the name. Linnaeus cites no collector; yet the sheet bears the letter K which means Kalm, who collected in Canada, New York, New Jersey and Pennsylvania, whereas Linnaeus ascribes vulpina to Virginia (and he would hardly have used the term "Virginia" as broadly as to include New Jersey and Pennsylvania), and also H. U. which means the garden or hortus at Upsala. The word *fox* (*vulpina*) does not aid us in identifying the Plukenet grape for at that time it may have been applied to more than one species and not alone to *V. Labrusca* as at present as, indeed, is done by Plukenet himself; in fact, the muscadine (*V. rotundifolia*) was once known as fox grape.[2]

The Linnaean sheet bears two specimens, the lower one of three leaves apparently from the wild and collected by Kalm, the upper one of three[3] leaves and two flower-clusters being grown at Upsala from Kalm seeds. The Linnaean sheet of *Vitis Labrusca* is also marked with a K, showing that Peter Kalm collected it; and in this case, as we have seen, the species is supported by the picture (Fig. 98) in Plukenet, but we have no cited figure back of *V. vulpina*.

It is apparent that Linnaeus meant to designate two American grapes, one species (*Labrusca*) with tomentose leaves, and the other (*vulpina*) with naked leaves. We have noted (page 186) that his *Labrusca* appar-

[1] Bailey, Evolution of Our Native Fruits, 103 (1898).

[2] In July, botanizing with two experienced amateurs of Norfolk, Virginia, we came to *V. vulpina* (*V. cordifolia*) on the outermost coast of Virginia (Back Bay). Looking at it they immediately exclaimed "Fox Grape!"—M. L. F.

[3] The photograph shows only 2.

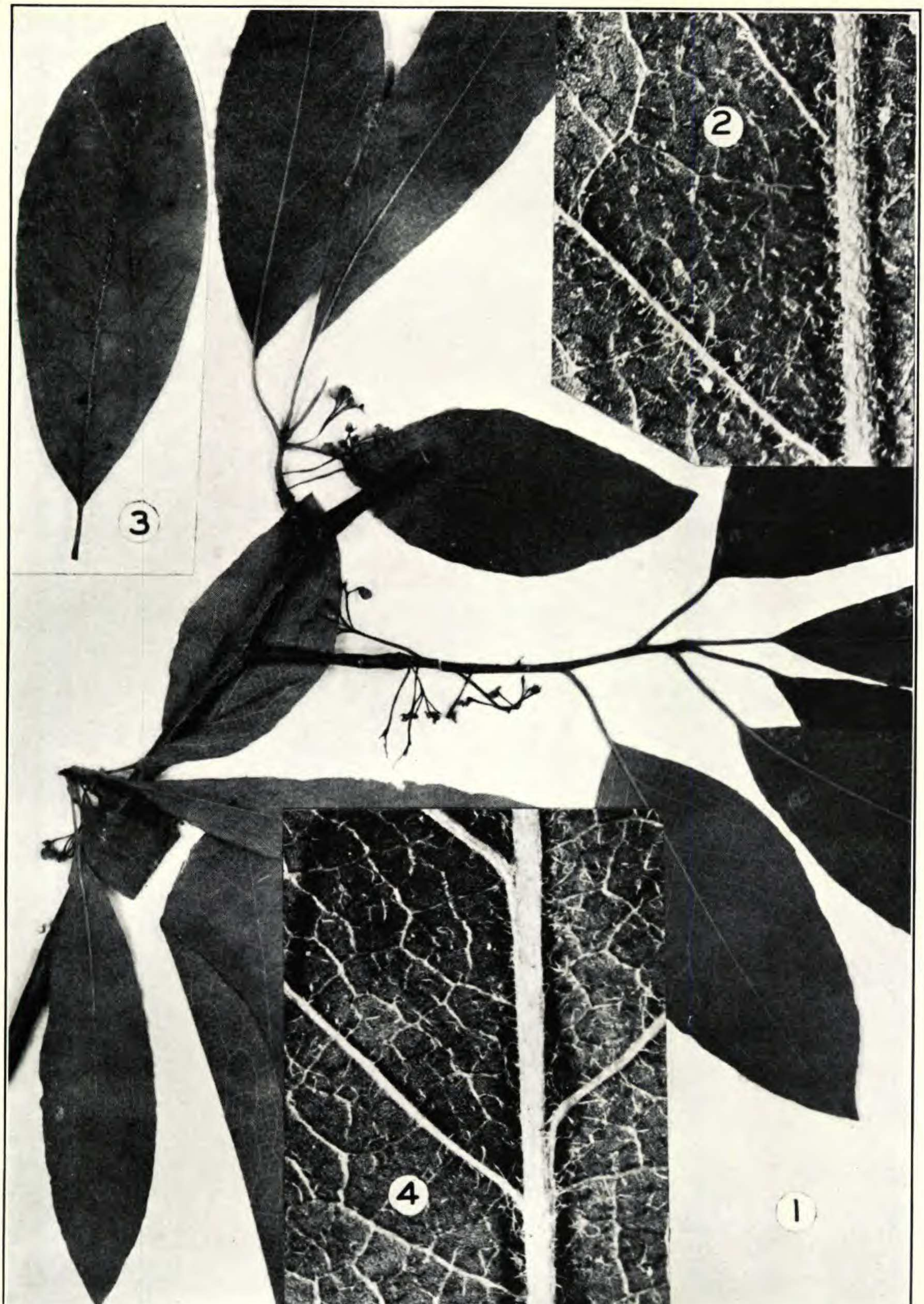


Photo. W. H. Hodge

ILEX DUBIA: FIG. 1, TYPE, × 1 (courtesy of Dr. FRANCIS W. PENNELL); FIG. 2, lower surface of leaf, × 10; FIG. 3, leaf, × 1, from ISOTYPE of *I. Amelanchier;* FIG. 4, lower surface of leaf shown in FIG. 3, × 10.

Type-sheet of VITIS VULPINA, × ½ (courtesy of Mr. S. SAVAGE).

ently included *aestivalis*, and his *vulpina* is undoubtedly also to be considered an aggregate species and one therefore has considerable latitude in interpretation of it. If there is extant an authentic Plukenet specimen of his "Virginian nigra" it might either change the application of *V. vulpina* or eliminate it as a *nomen confusum*.[1]

In view of the simple facts, that in preparing *Species Plantarum* Linnaeus had in his own herbarium and himself labeled two sheets bearing what he called *Vitis vulpina* and described the fuller of them in the very typical Linnean diagnosis (although Bailey says "not described"), the earlier references are wholly secondary in a nomenclature which avowedly and actually begins with 1753. Obviously, as Professor Bailey correctly concluded, the full sheet bearing above a flowering branch from the Upsala garden ("H.U." below the specimen indicating Hortus Upsaliensis) should stand as the type of *V. vulpina*. Plate 560 shows this sheet, × ½, and probably every botanist who knows the southern *V. cordifolia* will agree with Bailey that the type of *V. vulpina* L. is *V. cordifolia* Michx. Bailey protests the ascription by Linnaeus of a plant supposedly originating from Kalm's collections to Virginia; but when Linnaeus got a *Potentilla* from Hudson Bay and named it *P. pensylvanica* and a *Berberis* from the South and called it *B. canadensis*, it is evident that he had no clearer conception of American geography than do most present-day European botanists and little appreciation of the geographic significances of the names he repeatedly used; it sometimes seems as if he had a small series and used at random such trivials as *canadensis*, *marilandica*, *pensylvanica* and *virginiana*. At any rate, Kalm spent much time within the range of true *V. vulpina* (*V. cordifolia*), which occurs in northern Delaware, southern New Jersey and eastern Pennsylvania. It would have been very difficult for him not to see it.

Although Bailey has said that from a correction of the error to which he clings "the net gain would be confusion," it can not be overlooked that the confusion would be only temporary and that long prior to his misapplying the name *Vitis vulpina* L. to *V. riparia* Michx., instead of to *V. cordifolia* Michx., the Linnean name had been correctly used for *V. cordifolia* by several early botanists: by Muhlenberg[2] who definitely reduced *V. cordifolia* to its synonymy; by Torrey, who did the same[3]; by Beck, Le Conte and several others. In fact, if there

[1] Bailey, Gent. Herb. iii. fasc. iv. 236 (1934).
[2] Muhl. Cat. 27 (1813).
[3] Torr. Fl. N. Mid. U. S. 264 (1824).

were any question about the identity of *V. vulpina* and *V. cordifolia* it was very clearly settled by the distinguished botanist who bought the Linnean collections and established them in London. In 1819 Sir James Edward Smith, treating *Vitis* in Rees' Cyclopedia (xxxvii.) correctly applied the name *V. riparia* Michx. to the "Sweet-scented Vine," with "leaves unequally and deeply toothed, slightly three-lobed." He also correctly described *V. vulpina* L., with the synonym *V. cordifolia* Michx., the "Winter Grape, or Chicken Grape"; and, from his study of the Linnean material which he had purchased, explicitly said: "This is certainly the *vulpina* of Linnaeus, and consequently of Willdenow, though Pursh cites the latter author under the foregoing species [*V. aestivalis*]. The *leaves* of the present have but a slight indication of a lobe at each side, and are more oblong and pointed than either of the two last [*V. Labrusca* and *V. aestivalis*]; being moreover quite smooth, from the earliest period, except the little axillary tufts of hair on the under side."[1] See PL. 560.

Sir James Edward Smith and several others of his time had the identities correct and Smith's correct typification of 1819 antedates the erroneous one by three-fourths of a century. By our rules of nomenclature (I do not get the full significance of Bailey's reference to "Rules of nomenclature adopted since the foregoing publication") Smith's typification, having no flaw in it, properly stands. The present-day temporary confusion is wholly secondary to the correct typification established 120 years ago!

VITIS ARANEOSA Le Conte.—In 1853 John Le Conte published as new species of the southeastern states four members of *Vitis*. One of them, *V. araneosa* Le Conte in Proc. Acad. Philad. 1852–53: 272 (1853), seemed, in its "berries of a middling size, .5 of an inch in diameter, black," so distinct from ordinary *V. aestivalis* Michx. to which Bailey (Gent. Herb. iii.[4] 154) reduces it and which he describes as having "berries . . . with medium to thick bloom," that I took to Philadelphia a representative series of the rufescent-leaved species for comparison with it. Le Conte's account was as follows:

[1] At the Aberdeen meeting of the British Association in September, 1885, Radlkofer thus referred to Smith's elucidation of the Linnean species: "As far as the Linnean Herbarium is concerned, Sir Edward Smith in his day endeavoured to extract therefrom a correct conception of the Linnean species; but the slender scientific means of his time enabled him to arrive at the goal in only a few instances. Nevertheless his contributions to Rees's 'Cyclopaedia' on this subject are of great value, and deserve republication in a collective form, in order to make them generally available."—Radlkofer in Rep. Fifty-first Meeting Brit. Assoc. Adv. Sci. 1080 (1886).

6. V. ARANEOSUS. Foliis lato-cordatis, sublobato-angulatis, integris, trilobis aut quinquelobis, lobis acuminatis, dentatis, dentibus submucronatis, supra glabris, subtus arachnoideo-villosis, villositate plus minus ferruginea. Racemis subdensis, baccis maioribus nigris.

Hab.—In the upper parts of Georgia. Vulg. Fox grape.

Stem moderately large and high. Leaves broad, cordate, sublobately angled, entire and three or five-lobed, acuminate dentate; the teeth submucronate, above glabrous, beneath arachnoideo-villous, more or less ferruginous; in the older leaves this villosity forms into small tufts or knots, and in the very oldest almost entirely vanishes, although in the youngest it is very thick and close. Racemes dense; berries of a middling size, .5 of an inch in diameter, black, often very sweet and agreeable. The leaves are sometimes 8 inches long and as many wide.

The species is well worth cultivating.

Whereas three of Le Conte's four newly proposed species were from New Jersey, from "Carolina and Georgia in swamps," and from "Virginia and Maryland," respectively, *Vitis araneosa*, with black berries half-an-inch in diameter, came from "the upper parts of Georgia," where it is called "Fox grape." One of the several folders of loose leaves and branchlets in the Le Conte series contains small and medium-sized leaves as described by Le Conte and at least one to support the "sometimes 8 inches long and as many wide" of his account. This folder has the accompanying label:

(3) From Dr. Ware's gardens at Athens [upper Georgia], Sept. 14th, 1850. Supposed to be the Wild Fox or Winter Grape. Fruit in very compact bunches or clusters; tolerably pleasant to the taste; not very sour. Color = black. Size = [a circle ½ in. across].

That this sheaf of specimens, the only ones from upper Georgia and closely matching the original account of *Vitis araneosa*, should be accepted as the type-material of that species there seems no reasonable doubt. It is, therefore, significant that it is closely matched by an isotype of *V. rufotomentosa* Small, Fl. Se. U. S. 756, 1334 (1903) and quite as well by material from upper Georgia (Kenesaw Mt., *Perry & Myers*, no. 935) which Professor Bailey has correctly marked *V. rufotomentosa*. The latter species, originally described by Small with "berries black, with little or no bloom," is, it seems to me, inseparable from *V. arancosa* Le Conte (1853) and must take the latter name, *V. araneosa* Miquel from Sumatra dating from 1860, *V. araneosa* Dalz. & Gibs. of India from 1861.

SPHAERALCEA **angusta** (Gray), comb. nov. *Malvastrum angustum* Gray in Mem. Am. Acad. n. s. iv[1]. (Pl. Fendl.), 22 (1849).

It is with great hesitation that I make a transfer in the complex and

quite unsettled group of *Sphaeralcea*, including *Malvastrum*. I follow Kearney in his *North American Species of Sphaeralcea Subgenus Eusphaeralcea* (Univ. Calif. Pub. Bot. xix[1]. (1935)) in uniting *Malvastrum*, typified by *M. coccineum* (Pursh) Gray, with *Sphaeralcea*. Rydberg has proposed *Sphaeralcea angusta* (*Malvastrum angustum* Gray) as a monotypic genus, *Sidopsis* Rydb. Fl. Pr. Pl. Centr. N. Am. 541 (1932). Unfortunately, however, the only species, with the stated range "Tenn.—Iowa—Kans.," was given the specific name "*S. hispida* (Ell.) Rydb.," based upon *Sida hispida* Ell. If Elliott be looked up it will be found that in his Sketch of the Botany of South-Carolina and Georgia, i. 159 (1821) he correctly assigned the name *Sida hispida* to Pursh, Fl. Am. Sept. ii. 452 (1814), where it was originally published for a plant of "sandy plains in Georgia" seen by him in Herb. Lyon. Whether or not Elliott's plant from South Carolina or Georgia was the same as the plant Pursh saw in Lyon's herbarium is not known. The range of his *Sidopsis hispida*, given by Rydberg, explicitly excludes the regions of both Pursh's and Elliott's plants. The plant occurring from western "Tenn.—Iowa—Kans." was listed from St. Louis (*Drummond*) by Hooker, Journ. Bot. i. 198 (1834), but whether it is what Pursh and Elliott had is open to serious question. In publishing his *Malvastrum angustum* Gray cited "Sida hispida, *Pursh; Fl.* 2. *p.* 452? *Hook.! Jour. Bot.* 1. *p.* 198" and continued: "This is probably Pursh's plant; but I have not seen it from Georgia. Drummond gathered it at St. Louis." In his latest statement, under *Malvastrum angustum*, Gray gave the synonymy: "*Sida hispida* Hook. Journ. Bot. i. 198, perhaps Ell. Sk. ii. 159, hardly Pursh, Fl. ii. 452."[1]

In view of the complete doubt about the identity of *Sida hispida* Pursh, which antedated Elliott by seven years and which was presumed by the latter author to be his plant, it is quite unwise to force upon the plant of dry barrens and hills of the Mississippi basin the name of an unidentified plant of Georgia and possibly South Carolina. I am, therefore, retaining for the plant of the Mississippi basin the first name which unquestionably belongs to it. If and when Pursh's type is found and positively identified with *Sphaeralcea angusta* Pursh's name will be justified; at present its use would be to questionable.

PASSIFLORA LUTEA L., var. **glabriflora**, var. nov., calicis tubo glaberrimo: caulibus glabris vel rarissime pilosis; foliis glabris.—

[1] Gray, Syn. Fl. N. Am. i[1]. 308 (1897).

Southern Ohio to Missouri, south to Tennessee, Arkansas and Texas. TYPE: base of cliff between Sugar Loaf and Falling Spring, St. Clair County, Illinois, October 5, 1918, *J. M. Greenman*, no. 3926.

All material in the Gray Herbarium from Ohio, Indiana, Kentucky, Tennessee, Illinois, Missouri, Arkansas, Oklahoma and Texas has the calyx and leaves quite glabrous and all but two sheets (from Texas) have the stems glabrous. Contrasted with this glabrous extreme in the interior of the country is the series from the Atlantic Slope. All specimens from eastern Pennsylvania, Delaware, Virginia, North Carolina, South Carolina, Georgia and Florida, which are in condition to show them, have the calyx-tubes pilose or hirsute. The stems, especially when young, are more or less pilose-hispid, in many plants abundantly and permanently so, in others with the pilosity disappearing in age. Since the type came from Virginia the plant with pilose calyx-tube must be treated as typical.

HYDROCOTYLE VERTICILLATA Thunb., var. **triradiata** (A. Richard), comb. nov. *H. tribotrys* Ruiz & Pavon, Fl. Peruv. iii. 24, t. 246, fig. *b* (1802). *H. polystachya* A. Richard, var. α *Triradiata* A. Richard in Ann. Gen. Sci. Phys. iv. 171 (repr. as Monogr. Gen. Hydrocotyle, 51) (1820). *H. racemosa* Moc. & Sessé ex DC. Prodr. iv. 70 (1830). *H. bonariensis* Lam., var. *tribotrys* (Ruiz & Pavon) G. Don, Gen. Hist. Dich. Pl. iii. 249 (1834). *H. prolifera* Kellogg, Proc. Calif. Acad. Sci. i. 15 (1854) and ed. 2, i. 14 (1873), not Otto (1839). *H. natans* Torr. Bot. Mex. Bound. 69 (1859). *H. umbellata* L., var. (?) *ambigua* Gray, Man. ed. 5: 190 (1867). *H. verticillata*, vars. *tenella*, *13-nervis*, *longipedunculata* and *pluriradiata* Urban in Mart. Fl. Bras. xi[1]. 268 (1879). *H. Canbyi* Coult. & Rose in Bot. Gaz. xii. 103, t. 4 (1887). *H. ambigua* (Gray) BSP. Prelim. Cat. N. Y. 21 (1888), not Pursh (1814). *H. australis* Coult. & Rose in Contrib. U. S. Nat. Herb. vii. 28 (1900).

I fully concur with Dr. Mathias in Brittonia, ii. 204 and 240 (1936) in feeling that the plant known in current manuals as *Hydrocotyle Canbyi* is separable from *H. verticillata* only through its pedicelled flowers and fruits. The synonymy given above is drawn from her papers. But, following the International Rules of Botanical Nomenclature, it becomes unfortunately necessary to add another to the many names under which the plant has been somewhat misinterpreted.

Art. 55 reads, in part:

> When a variety or other subdivision of a species is transferred, without change of rank, to another genus or species (or placed under another generic or specific name for the same genus or species), the original subdivisional epithet must be retained or (if it has not been retained) must be re-established.

Treated as a variety, the plant under discussion should take the varietal name *triradiata*, the first trivial name given to it (by Achille Richard in 1820) as a variety. Instead, Dr. Mathias uses for it, as a variety, the first trivial name given to it as a species. In her treatment she indicates doubt as to the identity of *H. tribotrys* and of *H. polystachya* var. *triradiata* which was based upon it; but she expresses no doubt about the identity of *H. bonariensis* var. *tribotrys*, which was a mere nomenclatural transfer by George Don of *H. tribotrys* to varietal rank. Dr. Mathias explains her doubt as to the first two names, based on the same type, as follows:

> The type specimen of *H. tribotrys* R. & P. has not been seen and the plant in the Madrid Herbarium so named is obviously mislabeled since the leaves are non-peltate. This specimen has been referred to *H. alchemilloides*. The plant illustrated and described as *H. tribotrys* by Ruiz & Pavon apparently belongs to this variety.

The fact that someone, during more than a century, mislabeled as *H. tribotrys* a plant which is quite unlike that described and illustrated by Ruiz & Pavon does not alter the identity of the plant they so clearly described "foliis peltatis subrotundo-reniformibus . . . Flosculi in verticillos remotos, quinquefloros, . . . breviter pedunculati," and so beautifully illustrated. Dr. Mathias has no doubt that the plant illustrated and described was the ramose extreme of our *H. Canbyi;* neither have I. The Ruiz & Pavon description and plate were of the large extreme with trifurcate inflorescences; and they are readily matched by various specimens from as far north as Cape Charles ("Cape Charles, Maryland" [Virginia], *Tidestrom*, no. 11,615; Lake Worth, Florida, *A. H. Curtiss*, no. 5676; Georgetown, Texas, *Edw. Palmer*, no. 383 [or ?353]; Devil's River, Texas, *Havard*, no. 139; etc.). Since *H. polystachya* var. *triradiata* (1820) and *H. bonariensis* var. *tribotrys* (1834) were both based exclusively on the Ruiz & Pavon description and plate, Richard preferring to give a slightly better name, the doubt indicated regarding the former would apply equally to the latter. I do not feel that there is appreciable doubt.

In the Gray Herbarium Dr. Mathias, in 1935, placed revision-labels indicating for *H. verticillata* var. *triradiata* a varietal combination different from the one she later published. The unpublished combination, based upon *H. prolifera* Kellogg (1854), doubtless occurs in other herbaria. Care should be taken to guard against its inadvertent publication.

CICUTA MACULATA L., var. **Curtissii** (Coult. & Rose), comb. nov. *C. curtissii* Coult. & Rose, Contrib. U. S. Nat. Herb. vii. no. 1—Mon. N. Am. Umbelliferae, 97 (1900).

Coulter & Rose separated the southern Coastal Plain *Cicuta Curtissii* from the northern and wide-ranging inland *C. maculata* by "rootstock much thicker; leaflets thickish, conspicuously reticulate beneath; fruit orbicular, 2 mm. long, constricted at the commisure; ribs approximately equal in surface display; the laterals largest in section, but not wedge-shaped or closely contiguous; dorsal and intermediate ribs about as broad as the intervals; oil tubes large." The type cited was *Curtiss* no. 1030 from Duval County, Florida; and the range was given as "From southern Virginia and southeastern Kentucky to Florida and Louisiana." Since their *C. Curtissii* had previously been confused with *C. maculata*, their definition of the latter becomes important; "leaflets rather thin, from narrowly lanceolate to oblong-lanceolate, . . . coarsely and sharply serrate, . . . reticulation indistinct; fruit oblong, 4 mm. long, not constricted at the commissure," etc. In brief, as shown by the type number and by much other material from stations north to Virginia, the leaflets of *C. Curtissii* are oblong-lanceolate to lance-ovate, with the secondary veins prominent beneath, the margins coarsely crenate to serrate-dentate with broad-based semi-ovate teeth, the larger leaflets of the lower (ternately decompound) leaves 2.5–5.5 cm. broad; fruits nearly round, 2–3 mm. long, the marginal ribs separated by a clearly defined dark furrow.

Cicuta maculata, as left by Coulter & Rose, when they separated off their *C. Curtissi*, is of wide range from the Gaspé Peninsula, Quebec to eastern Manitoba, south across the northern states to the uplands of North Carolina, and Tennessee, Missouri and Oklahoma. Its thin leaflets are narrowly to broadly lanceolate or lance-oblong, with the secondary veins less prominent beneath as compared with *C. Curtissii*, the margins sharply serrate with prolonged lanceolate teeth, the larger leaflets 0.5–3 cm. broad; fruits ellipsoid or ovoid, 2.5–4 mm. long, the marginal ribs confluent until maturity, without a dark intermediate furrow.

If the two series would stay within these bounds there would be no question of their specific distinctness; but, unfortunately, it is not difficult to find quite reniform-globose fruits with the marginal ribs wholly confluent but with the thin and slender-toothed leaflets in the

North, while many otherwise typical specimens of *C. Curtissii* from the South have a few fruits with confluent marginal ribs mixed with the more typical fruits in the same umbel. In fact, Coulter & Rose themselves threw a doubt on the specific distinctness of *C. Curtissii*. They cited the 11 sheets of typical *C. Curtissii* which they had seen; but under *C. maculata* cited 9 others which were atypical of the latter species, "the leaves . . . thicker and strongly reticulated, as in *C. curtissii*, the two types of fruit are represented—one with very broad corky ribs and narrow intervals, the other with ribs and intervals as in *C. maculata* but with fruit almost orbicular." Small, likewise, maintaining the two as species, *C. maculata* with "typically" oval or ovoid fruits, *C. Curtissii* with them "typically" subglobose or reniform-globose, referred to globose-fruited northern specimens with the foliage and confluent marginal ribs of *C. maculata* as "sporadic" *C. Curtissii* "as far North as Nova Scotia" (Man. 975). In short, Coulter & Rose found the characters used to separate the two extremes not constant; neither did Small; neither do I.

Cicuta maculata, until Coulter & Rose's separation from it of *C. Curtissii*, was treated as an unvarying species, except for var. *angustifolia* Hook. Fl. Bor.-Am. i. 259 (1834) from the Saskatchewan, a plant very inadequately described but probably belonging to the western *C. occidentalis* Greene. In originally publishing *Cicuta maculata* L. Sp. Pl. i. 256 (1753) Linnaeus had in mind both the thin-leaved plant with slender teeth and *C. Curtissii*. He gave an original diagnosis based on the plant in his own herbarium, with "serraturis mucronatis." This was a specimen from Kalm and the photograph of it, kindly supplied by Mr. Savage, well shows the common northern thin-leaved extreme with lance-attenuate slender-toothed leaflets. After his own diagnosis Linnaeus cited *Aegopodium foliolis lanceolatis* of Gronovius; then he gave a reference to a Plukenet figure, and last (also least, in importance) a reference to Morison. Plukenet's figure is of *C. maculata*, as left by Coulter & Rose, after they removed *C. Curtissii;* but, to give an element of confusion to the matter, the Clayton plant on which Gronovius based his *Aegopodium foliolis lanceolatis* was, as shown by the beautiful photograph supplied by Mr. Ramsbottom, very characteristic *C. Curtissii*. This, in view of the fact that Linnaeus included both extremes, would be of only secondary interest had not Coulter & Rose specially designated the Clayton specimen as typical of *C. maculata:* "Type locality. 'in Virginiae aquosis'; collected by Clayton."

Photo. W. H. Hodge

CICUTA VICTORINII: FIG. 1, TYPE, × ½; FIG. 2, fruits, × 10.
C. MACULATA: FIG. 3, fruits, × 10.

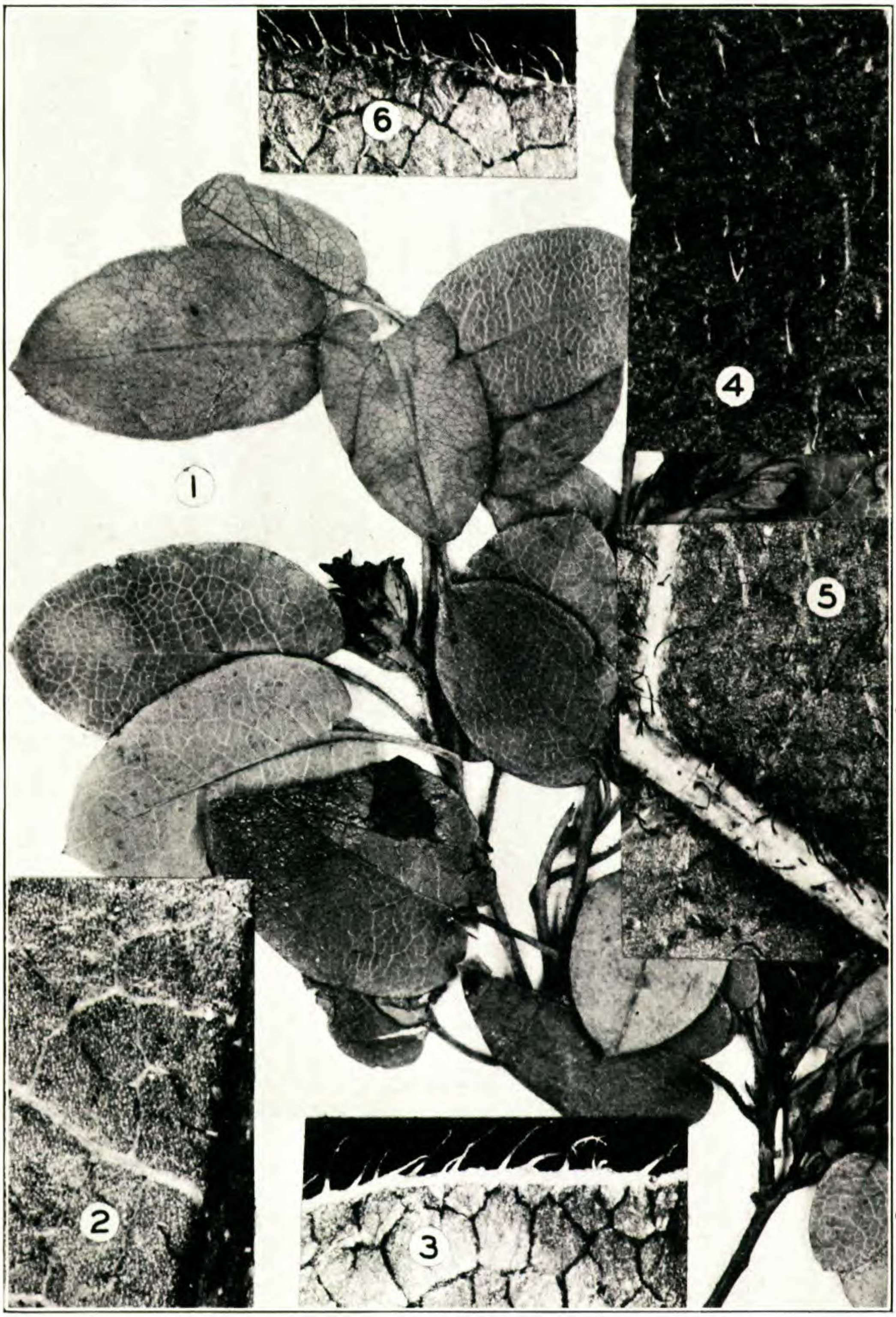


Photo. W. H. Hodge

EPIGAEA REPENS: FIG. 4, upper surface of mature leaf, × 10; FIG. 5, lower surface, × 10; FIG. 6, ciliation, × 10.

Var. GLABRIFOLIA: FIG. 1, portion of TYPE, × 1; FIG. 2, lower surface of leaf, × 10; FIG. 3, ciliation, × 10.

In view, however, of the facts that neither Coulter nor Rose had seen the specimens studied by Linnaeus and that their definition of *C. maculata* accords with the specimen in the Linnean Herbarium, not with that of Clayton, I am taking as the type of *C. maculata* the former specimen. Surely Coulter & Rose did not understand the specimens, for they certainly would not have set up *C. Curtissii* as a new species (which abounds in eastern Virginia) and immediately have intentionally designated as type of the Linnean species a characteristic specimen of their proposed new species. By holding to the specimen which Linnaeus himself had prior to 1753 confusion is avoided.

CICUTA **Victorinii**, sp. nov. (TAB. 561), planta perennis radicis tuberoso-carnosis; caulibus 3–6 dm. altis; foliis biternatis, segmentis lineari-lanceolatis 1.5–4 cm. longis dentato-serratis; umbellis 3–8 cm. latis; fructibus reniformibus vel cordato-ovoideis, 3.5–4 mm. longis, costis lateralibus prominentibus aliis obscuris.—Tidal flats of the St. Lawrence River, QUEBEC: grèves intercotidales, Cap Rouge près du Pont de Québec, 9 août 1922, *Victorin*, no. 15,479 (TYPE in Herb. Gray, ISOTYPES in Herb. Univ. Montréal and in Herb. Victorin); grèves intercotidales, St. Laurent de l'Ile d'Orleans, 16 août 1922, *Victorin*, no. 15,480 (in same herbaria).

In its reniform or cordate-ovoid fruits with all the ribs obscure except for the 2 laterals *Cicuta Victorinii* is very distinct. Its very narrow and relatively few leaf-segments are also distinctive. In the wide-ranging and coarse *C. maculata* L., the common species of eastern North America, the ellipsoid or ovoid fruits (FIG. 3) have alternating rounded ribs and dark furrows, usually with the marginal ribs confluent until maturity. *C. Victorinii*, collected only by Brother Victorin, is another of the notable species restricted to the estuary of the St. Lawrence.

In PLATE 561, FIG. 1 shows a plant, × ½, of the TYPE-COLLECTION; FIG. 2, a group of fruits, × 10.[1] FIG. 3 is a group of mature fruits, × 10, of *C. maculata* from Bridgewater, Nova Scotia, *Fernald & Long*, no. 24,249.

ZIZIA **aptera** (Gray), comb. nov. *Thaspium trifoliatum* (L.) Gray, var. *apterum* Gray, Man. ed. 2: 156 (1856).

Zizia aptera is the transcontinental plant which regularly passes as *Z. cordata* (Walt.) Koch in DC. Prodr. iv. 100 (1830). The name *Z.*

[1] The umbellets all show the result of being twice-a-day submerged, their pedicels being enmeshed with extraneous matter.

cordata rests upon *Smyrnium cordatum* Walt. Fl. Carol. 114 (1788); but, unfortunately, it must be abandoned for the species of *Zizia* for two reasons. In the first place *Smyrnium cordatum* was an illegitimate name given by Walter as a substitute for *Thapsia trifoliata* L. Sp. Pl. i. 262 (1753). Nomenclaturally *Smyrnium cordatum* is the same as *Thapsia trifoliata;* it could not properly be the basis of a combination under *Zizia* because the type of *Thapsia trifoliata* is well known to be a member of *Thaspium.* Blake, examining the type of the latter, reported[1] that it is the eastern plant described as *Smyrnium atropurpureum* Desr.; Gray, many years earlier, in a detailed manuscript on the Linnean Herbarium, recorded "*Thapsia trifoliata* = *S. atropurp.*"; and the sheet in the Linnean Herbarium, bearing in the hand of Linnaeus "*trifoliatum,*" shows, through the photograph supplied by Mr. Savage, that the identifications of Gray and, later, of Blake are not to be questioned. Although Gray, in 1856, had not cleared the two generic elements, *Thaspium* and *Zizia,* he did understand the identities of the two plants in question. In edition 2 of the Manual, l. c., he took up as an aggregate species *Thaspium trifoliatum,* with two varieties: var. *atropurpureum* with the correct synonymy "Thápsia trifoliata, *L.* Smyrnium cordatum, *Walt.* Thaspium atropurpureum, *Nutt.*"; and the new "Var. **ápterum.** Petals yellow: fruit with sharp ribs in place of wings. (Zizia cordata, *Koch, Torr.*)" In other words, Gray correctly distinguished *Zizia cordata,* as understood by Koch and by Torrey (sensu Koch and Torrey), from *Smyrnium cordatum* Walt., which he knew to be based upon and identical with *Thapsia trifoliata* L.; but, as already indicated, since Walter had substituted for the Linnean *Thapsia trifoliata* his new name *Smyrnium cordatum,* his specific epithet cannot be made the basis of a combination in another genus.

Even if it be argued by those (if there are any) who think with Farwell[2] that the citation by an author, when he publishes a new name with a diagnosis, of a previously published name does not mean that he intended the two as synonymous, the fact remains that the only one of the two plants, *Thaspium trifoliatum* and *Zizia aptera,* known in Walter's territory is the former. This (typical *T. trifoliatum,* with umbels only 1.5–3(–4) cm. broad, the greenish to purple flowers all stalked and the rounded-ellipsoid fruits with broad dorsal wings) is

[1] See Blake, RHODORA, xx. 52 (1918).
[2] Farwell, Mich. Acad. Sci. Rep. xxi. 368 (1920) and RHODORA, xli. 80 (1939).

generally dispersed in the region known to Walter. *Zizia aptera*, a true *Zizia* with the central flower and fruit of the umbellet sessile, the fruits with filiform ribs, and in *Z. aptera* the flowers yellow, is not known in Walter's territory. The only specimens of it seen by Coulter & Rose from the Atlantic states south of the Potomac were from Asheville, North Carolina. Collections, mostly since the time of Coulter & Rose, show it to be in the upland and piedmont regions of Virginia and northern North Carolina, thence along the mountains to Georgia. I have seen no material of it from Walter's region of southeastern South Carolina.

In connection with the taking up for the transcontinental *Zizia* of the name *aptera*, based upon an old varietal name, it is necessary to note *Z. sylvatica* Benke in RHODORA, XXXV. 45 (1933). Its author distinguished *Z. sylvatica* from "*Z. cordata* (Walt.) DC." as follows:

> "*c.* Cauline leaves all divided; rays of umbel rather as in *Z. aurea;* plants mostly of open ground.....*Z. cordata* (Walt.) DC.
> *c.* One or more cauline leaves undivided; other leaves and umbel rather as in *Z. Bebbii;* plants of shaded woods .....*Z. sylvatica.*"

The type of *Zizia sylvatica* was from Tunnel Hill, Johnson County, Illinois, *Benke*, no. 5252. A beautiful sheet of the type collection, most kindly sent to the Gray Herbarium, shows the young fruits with the definite wings of *Thaspium*. In its upper trifoliolate leaves it is quite inseparable from characteristic material of *T. trifoliatum*, var. *flavum* Blake, the inequilaterally round-based and long-acuminate leaflets closely matched in the type of var. *flavum* and in many other specimens from woodlands and bottoms of West Virginia, Ohio, southern Michigan, Indiana, Kentucky, Tennessee, Illinois, Missouri and Arkansas. Although trifoliolate cauline leaves are more common in the typical *Thaspium trifoliatum* than in its generally more inland var. *flavum*,[1] simple ovate cauline leaves sometimes occur in each of them and occasionally nearly all (4 out of 5) of the cauline leaves of the former may be simple. I can find nothing to separate the isotype of *Zizia sylvatica* from *Thaspium trifoliatum*, var. *flavum*. Mr. Benke states that the cauline leaves of *Zizia aptera* (*Z. cordata* of authors) are "all divided."

[1] *Thaspium trifoliatum* is above defined. Var. *flavum* Blake in RHODORA, XX. 53 (1918), extending inland to Minnesota and south to Alabama and Arkansas, differs in its generally greater size, coarser and more knotty rhizome, simple basal leaves (when present) 3–10 cm. long (in typical *T. trifoliatum* 1.5–5 cm.); cauline leaves at 1st fork of stem with terminal leaflet 3–8 cm. long (as opposed to 2–4.5); umbel 3–9 cm. broad (as opposed to 1.5–4); petals yellow; and fruit 4–5 (instead of 3–4) mm. long.

In the rather small representation of it in the Gray Herbarium, however, 1 or more simple cauline leaves are shown in 26 specimens (Staten Island, New York, *N. L. Britton;* Allegany State Park, New York, *Alexander & House,* no. 13112; Normansville, New York, *Burnham;* Mt. Cuba, Delaware, *Baker, Market & Goodale,* no. 53893; Long Mt., Frederick County, Virginia, *Griscom & Hunnewell,* no. 18782; Weldon, North Carolina, *E. B. Bartram;* and 20 numbers westward to the Pacific slope.

The type of *Thaspium trifoliatum,* var. *apterum* Gray, therefore of *Zizia aptera,* is the only sheet so marked by Asa Gray in the Gray Herbarium at the time of publishing the variety: a sheet in good fruit from "New York & New Jersey." Throughout most of its range *Z. aptera* has the subcoriaceous leaflets of the upper leaves closely and finely toothed. In the northwestern area of its occurrence, however, the leaves become membranaceous and the leaflets of the upper cauline ones are lacerate or coarsely jagged-toothed. This extreme I am calling

Z. APTERA, var. **occidentalis,** var. nov., foliis membranaceis; foliorum superiorum foliolis laceratis.—IDAHO: Soda Springs, June 21, 1892, *Mulford;* west side Sautianne Divide, Coeur d'Alene Mts., June 23, 1895, *Leiberg,* no. 1018. UTAH: swampy ground, Goodman's Ranch, near Bear River, Summit County, July 12, 1926, *E. B. & L. B. Payson,* no. 4957. OREGON: Sauvies Island, June, 1877, *Howell;* wet soil of Wallowa River, 3800 feet alt., June 11 and July 20, 1900, *Cusick,* no. 2401 (TYPE in Gray Herb.). WASHINGTON: meadows, Crab Creek country, June 13, 1884 and Spokane County, June 27, 1884, *Suksdorf,* no. 316; Pullman, July 24, 1893, *Piper,* nos. 1557, 1559; low meadows between Tonasket and Republic, Okanogan County, June 29, 1931, *J. W. Thompson,* no. 7120.

ZIZIA AUREA (L.) Koch, forma **obtusifolia** (Bissell), comb. nov. *Z. aurea,* var. *obtusifolia* Bissell in RHODORA, ii. 225 (1900).

EPIGAEA REPENS L.—To one familiar with *Epigaea repens* in Newfoundland, Canada and the northern states the plant of eastern Virginia seems surprisingly scabrous to touch; and study of the more than 300 collections in the Gray Herbarium and the herbarium of the New England Botanical Club shows that there are two well defined geographic varieties: (1) the southern extreme (FIGS. 4–6), with the over-wintered leaves scabrous on both surfaces with persistent, dark (becoming blackish) stiff hairs; (2) the northern extreme (FIGS. 1–3), with the lower old leaf-surface glabrous and nearly or quite smooth to touch (except sometimes for the hairy midrib), the upper surface

glabrous or promptly glabrate. The occurrence (number of specimens studied) of these two varieties by states and provinces is indicated in the accompanying table, the numbers (1 and 2) indicating the varieties as above defined.

	Var. 1	Var. 2		Var. 1	Var. 2
Newfoundland	0	11	Long Island	2	0
Quebec	0	19	New Jersey	5	0
Prince Edward Island	0	3	Pennsylvania	4	3
New Brunswick	0	2	West Virginia	1	2
Nova Scotia	0	7	Virginia	10	2
Ontario	0	5	North Carolina	3	2
Maine	0	56	Georgia	2	0
New Hampshire	0	54	Ohio	2	1
Vermont	0	18	Kentucky	3	0
Massachusetts	38	63	Tennessee	3	1
Rhode Island	5	0	Alabama	1	0
Connecticut	2	9	Michigan	0	2
New York (excluding Long Island)	1	11	Wisconsin	0	1
			Iowa	0	2

It will be at once evident that the southern extreme is not found in Newfoundland, Canada and northern New England and has not been seen from Michigan, Wisconsin and Iowa; conversely the northern variety, the only one known from these areas, becomes rare southward. In Massachusetts the northern plant with glabrous lower leaf-surfaces is generally dispersed, but all the material from the outer islands (Nantucket and Martha's Vineyard) and most from the southeastern mainland northward into Norfolk and southern Worcester Counties and up the sand plains of the Connecticut Valley is the southern extreme. From New York the only material of the southern extreme in the small representation studied is from Long Island and from the sand plains of the Hudson. The only Virginian material seen of the northern variety is from Bath and Giles Counties and the glabrous-leaved material from North Carolina (Lynn, Polk Co., and Blowing Rock) and Tennessee (Cade's Cove at 2300 feet) is from the mountains.

It is very clear then, that *Epigaea repens* occurs as two well defined geographic varieties ("subspecies," "apomicts," "races"): a prevailingly southern plant with mature leaves scabrous and persistently setose or pilose on both surfaces; and a prevailingly northern plant with the mature leaves glabrous (except for the sometimes pilose midrib) beneath (or promptly glabrate), the upper surface usually glabrous or glabrate. In the ciliation of leaves (before too much weathering) there is a strong tendency for the marginal hairs of the southern plant to be more crowded (FIG. 6) than in the northern (FIG. 5). This, how-

ever, is a secondary character. The half-expanded new foliage of the southern variety and of the northern variety well display the chief difference, the expanding leaf of the former pilose over the whole surface, that of the latter completely glabrous or glabrous between the more or less pubescent nerves.

In establishing the binomial, *Epigaea repens* L. Sp. Pl. 395 (1753) Linnaeus gave the "*Habitat in* Virginiae, Canadae *pinetis*"; but he cited only references to the plant of eastern Virginia:

> 1. EPIGAEA. *Gen. nov.* 1087. *repens.*
> Memecylum. *Mich. gen.* 13.
> Arbutus foliis ovatis integris, petiolis laxis longitudine foliorum. *Gron. virg.* 49.
> Pyrolae affinis repens fruticosa, foliis rigidis scabritie exasperatis, flore pentapetaloide fistuloso. *Pluk. alm.* 309. *t.* 107. *f.* I.
> *Habitat in* Virginiae, Canadae *pinetis*. ♄.

Mitchell's *Memaecylum* [original spelling], one of his "Nova genera plantarum Virginiensium" was, obviously, the southern extreme. Gronovius, quoting Clayton, said "foliis . . . scabris rigidis"; and Plukenet, with Virginia specimens from Banister, specially emphasized the harsh leaves, "Foliis rigidis, scabritie asperatis." There can be no question that the scabrous-leaved southern variety is typical *Epigaea repens*. The northern extreme may be called

EPIGAEA REPENS L., var. **glabrifolia,** var. nov. (TAB. 562, FIG. 1–3), foliis subtus glabris vel glabratis (venis interdum exceptis), paginis superioribus glabris vel glabratis.—Labrador to Saskatchewan, south to Newfoundland, Nova Scotia, New England, Pennsylvania, West Virginia, Ohio, Michigan, Wisconsin and Iowa, and along the mountains to North Carolina and Tennessee. TYPE: dryish open sandy plains, Middleton, Nova Scotia, July 20, 1920, *Fernald, Pease & Long*, no. 22,167 (in Gray Herb.).

In PLATE 562, FIG. 1 is a portion of the TYPE of var. *glabrifolia*, × 1; FIG. 2, the lower surface of a leaf, × 10; FIG. 3, lower surface and ciliation, × 10; FIGS. 4–6, details of typical *Epigaea repens:* FIGS. 4 and 5, upper and lower surfaces of leaf, × 10, from near Surry, Virginia, *Fernald & Long*, no. 9763; FIG. 6, ciliation of leaf, × 10, from Eastham, Massachusetts, *F. S. Collins*.

ASCLEPIAS INCARNATA L., var. PULCHRA (Ehrh.) Pers., forma **candida**, nom. nov. *A. pulchra* Ehrh., forma *albiflora* House, N. Y. State Mus. Bull. ccxliii.–ccxliv. 61 (1923), not *A. incarnata*, forma *albiflora* Heller in Bull. Torr. Bot. Cl. xxi. 24 (1894).

BACOPA **cyclophylla**, nom. nov. *Herpestis rotundifolia* Gaertn. f.,

Fruct. iii. 186 (1807), not *B. rotundifolia* (Michx.) Wettst. in Engl. & Prantl. Nat. Pflanzenf. iv^{3b}. 76 (1891).

As shown by Pennell in Proc. Acad. Nat. Sci. Phila. lxxi. 244, for Dec., 1919 (March, 1920) and in Acad. Nat. Sci. Phil. Mon. i. 62, 63 (1935), *Herpestis rotundifolia* Gaertn. f., based primarily on a Bosc specimen, is not identical with *Monniera rotundifolia* Michx. (1803), which was the basis of *Bacopa rotundifolia* (Michx.) Wettst. Although *B. cyclophylla* is clearly distinct from *B. rotundifolia*, Pennell's definition of the latter (as *Macuillamia rotundifolia* (Michx.) Raf.) leaves the student in doubt. In defining *Macuillamia* on p. 49 (Mon. i. or Scroph. E. Temp. N. Am.) it is distinguished by "Corolla 7–8 mm. long"; but in the key to species on p. 57, *M. rotundifolia* and *M. obovata* are placed in a section with "corolla 5–7 mm. long" as contrasted with a third species with "corolla 3–4 mm. long." The helpless user of the key is "left high and dry." So he is when he trys the length of pedicels in the same key to species (p. 57). The first two species come under "pedicels 10–15 mm. long"; but the first of them there included is described with "pedicel 8–18 mm. long," the second with "pedicel 4–6 mm. long."

The North American Varieties of Veronica alpina (Plates 563–568).—The circumpolar *Veronica alpina* L. has at least seven strongly marked geographic varieties, six of them occurring in North America. In his "'Veronica' in North and South America"[1] Pennell (p. 14) defined true *V. alpina* (our pl. 563, figs. 1 and 2) of "Open slopes, East Greenland. Also in Scandinavia and the Highlands of Scotland," with "Capsule glabrous. Sepals glabrous on back, ciliate on margins, apparently but little shorter than the corolla. Plant usually 1–2 dm. tall, usually little branched at base," while he separated the European variety (our pl. 563, figs. 3 and 4) with "Capsule pubescent with glandless hairs. Sepals pilose on back as well as margins, much shorter than the corolla" as *V. pumila* Allioni; the latter extending south to the Pyrenees, Maritime Alps, Cevennes, etc. In all North America proper (west of Greenland) only the single *V. Wormskjoldi* was recognized, the variety of *V. alpina* with "Capsule and sepals with hairs which have rounded glandular tips, the sepals densely pilose on back. Plant usually 1.5–3 dm. tall, with pedicels 2–5 (–10) mm. long." *V. Wormskjoldi* (pl. 564) is the boreal American

[1] Pennell in Rhodora, xxiii. 1–22 and 29–41 (1921).

plant which, more conservatively, is known as *V. alpina*, var. *unalaschcensis* Cham. & Schlecht. (1827) or in Greenland as var. *villosa* (Wormskj.) Lange (1887). Pennell admitted the doubtfully worth while *V. Wormskjoldi nutans* (Bong.) Pennell, from the coast of Alaska; but in the three different plants of the cordilleran series (PL. 566–568) he saw only "a tendency . . . to have styles slightly longer, usually 1/4 to 1/3 the length of the capsule, rather than 1/6 to 1/4." Pennell's study is, so far as I am aware, the latest revision of all American members of the genus as such, although in 1932 he noted[1] the occurrence of *V. alpina* in both West and East Greenland and in Baffin Land. His "Scrophulariaceae of Eastern Temperate North America"[2] does not discuss the series, through the somewhat unique definition of Eastern Temperate North America as stopping at "the eastern border of New York on the east" (p. 1). Thus Pennell excluded from his consideration of the *Scrophulariaceae* of eastern temperate North America the *Veronica alpina* series of New Hampshire, Maine, Quebec and Newfoundland. Had his critical eye noted the alpine plant of northern Newfoundland (PL. 565), which I had misidentified as *V. alpina*, var. *unalaschcensis*, he would have found it as different from that too inclusive entity (*V. Wormskjoldi*) as the latter is from the southern European *V. pumila* of Allioni (PL. 563, FIGS. 3 and 4). Not only is the Newfoundland plant unique and really as near to *V. pumila* as to *V. Wormskjoldi;* the great mass of material from the Rocky Mountains to the Pacific seems to me strikingly unlike *V. Wormskjoldi*, to which Pennell and also Rydberg refer all cordilleran material. *V. Wormskjoldi* (*V. alpina*, var. *unalaschcensis*) occurs locally on alpine summits (at 3050–3500 m. alt.) south to Colorado, but most of the cordilleran material, from subalpine to Canadian areas, falls into three strikingly different endemic varieties (PLATES 566–568), one of wide range, another more restricted and in some characters more pronounced, another chiefly of the Cascade Mts. My interpretation of *Veronica alpina* in North America is condensed into the following synopsis.

a. Backs of sepals quite glabrous, the margins ciliate; capsule glabrous; flowering stems 0.5–2 dm. high; fruiting raceme dense, thick-cylindric, ellipsoid or obovoid, with most of the fruits imbricated . . . . . *V. alpina*, var. *typica*.
a. Backs of sepals and the capsules more or less pubescent . . . . *b*.

[1] RHODORA, XXXIV. 150 (1932).
[2] Acad. Nat. Sci. Phila. Mon. i. (1935).

Photo. W. H. Hodge

VERONICA ALPINA, var. TYPICA: FIG. 1, flowering plant, × 1, from Greenland; FIG. 2, mature calyx and capsule, × 10, from Greenland.

Var. AUSTRALIS (Var. *lasiocarpa; Veronica pumila*): FIG. 3, fruiting plant, × 1, from Hautes-Pyrénées; FIG. 4, calyx and capsule, × 10, from the Alpes Maritimes.

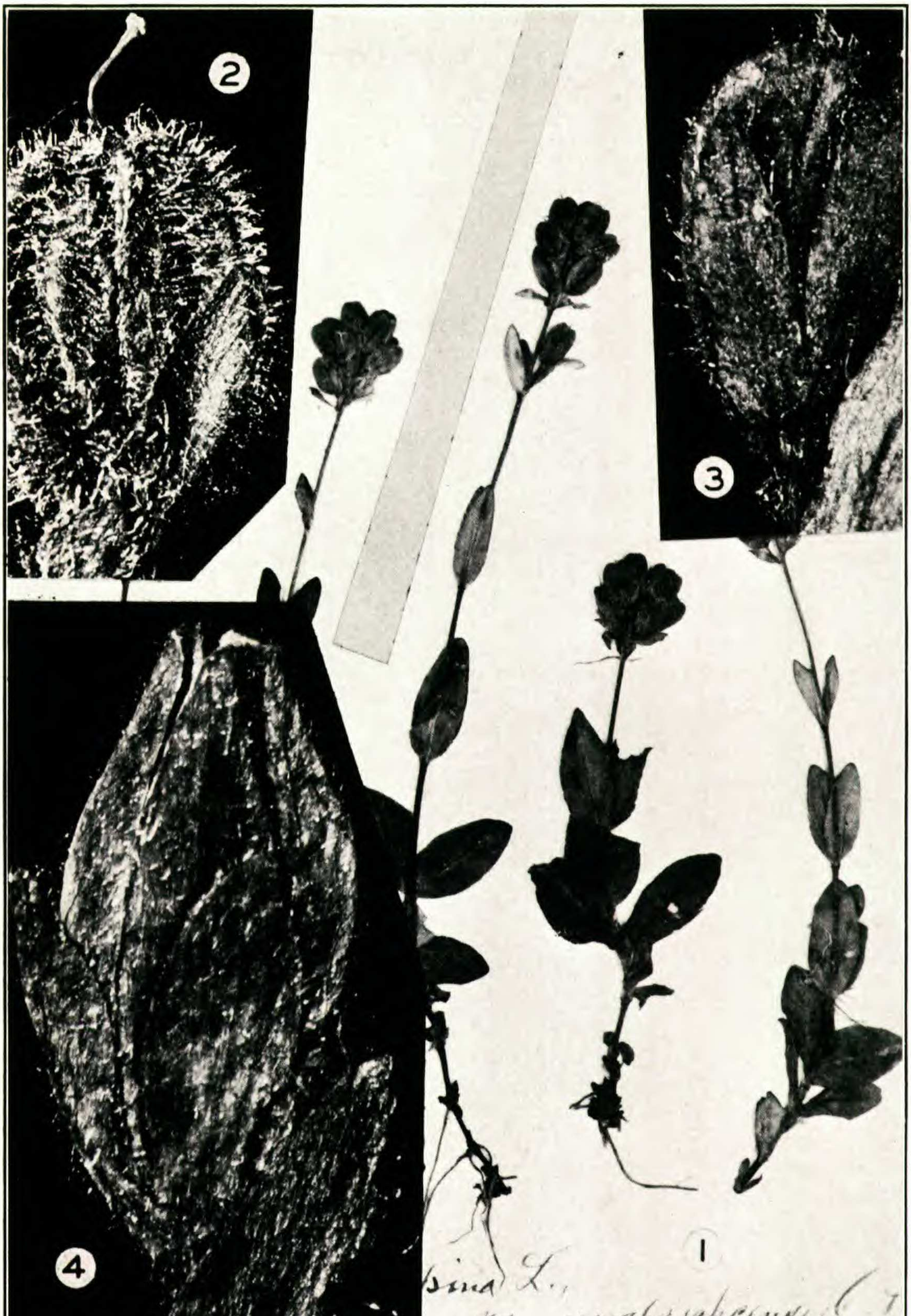


Photo. W. H. Hodge

VERONICA ALPINA, var. UNALASCHCENSIS (*V. Wormskjoldi*): FIG. 1, fruiting plants, × 1, from Labrador; FIG. 2, calyx and capsule, × 10, from plant in fig. 1; FIG. 3, less pubescent calyx and capsule, × 10, from Labrador; FIG. 4, less pubescent calyx and dehisced capsule, × 10, from New Hampshire.

b. Fruiting raceme dense, thick-cylindric, ellipsoid or obovoid, 1–6.5 cm. long, 1–1.6 cm. thick, the fruits closely approximate to strongly imbricated, except for the 1–3 lowest sometimes subremote ones, villous with multicellular hairs; mature style (capping fruit) 0.8–1.8 mm. long.

Leaves blackened in drying, those midway on the stem 4–20 mm. broad; upper internodes of stem spreading-long-villous; ciliation of sepals long-villous, partly of round-tipped ("glandular") septate trichomes; capsules fuscous or greenish- or bluish-black, copiously villous with chiefly round-tipped trichomes. . . . . Var. *unalaschcensis.*

Leaves only slightly or barely blackening, those midway on stem 3–7 mm. broad; upper internodes of stem short-pilose or incurved-villous with mostly slender-tipped hairs; ciliation of sepals short-pilose; capsules pale-brown, sparsely villous. . . . . Var. *terrae-novae.*

b. Fruiting raceme lax, the distinctly pedicelled fruits or pairs of fruits mostly becoming distant, the mature racemes (1–) 3–15 cm. long. . . . *c.*

c. Foliage-leaves 4–8 pairs, mostly opposite, blackening in drying, the upper ovate and acutish, the larger 1–2.2 cm. broad; lower bracts of raceme mostly lanceolate to ovate and equaling to exceeding their subtended flowers and fruits, upper bracts similar but narrower and shorter; lower 2–8 pairs of flowers and fruits opposite or subopposite; calyx 4–7 mm. long; style 0.75–1.5 mm. long; stems 1–4 dm. high. . . . . Var. *geminiflora.*

c. Foliage-leaves mostly oblong-lanceolate, elliptic or elliptic-ovate, with blunt or rounded tips, the larger 5–17 mm. broad; lower bracts of raceme mostly linear to lanceolate, the upper inconspicuous; calyx 2.5–4 mm. long; style 1.5–3 mm. long.

Leaves 4–7 pairs, often also 1–6 scattered alternate narrow upper ones, commonly drying green, the larger 5–12 (–17) mm. broad; flowers and fruits 9–25, mostly alternate; fruiting raceme slenderly cylindric, much interrupted, up to 1.2 dm. long, 0.5–1.2 cm. thick; sepals acute or acutish; capsule elliptic or narrowly obovate, 2.5–4 mm. broad; stems 1–3.3 dm. high. . . . . Var. *alterniflora.*

Leaves 3–5 (–6) pairs, all usually opposite, drying black, the larger 7–17 mm. broad; flowers and fruits 3–18, frequently opposite, the lower 1–3 pairs distant, the others subapproximate; fruiting raceme 1–7 (–9) cm. long, 1–1.4 cm. thick; sepals obtuse; capsule elliptic-suborbicular or broadly obovate, 4.5–5 mm. broad; stems 0.5–2 (–3) dm. high . . Var. *cascadensis.*

V. ALPINA L., var. **typica.** *V. alpina* L. Sp. Pl. 11 (1753); Pennell in RHODORA, xxiii. 14 (1921), ibid. xxxiv. 150 (1932); Devold & Scholander in Skrifter om Svalbard og Ishavet, no. 56 (Fl. Pl. and Ferns Se. Greenland): 82, figs. 16 (center) and 17 (1933). *V. alpina,* α *lapponica* Wahlenb. Fl. Carpat. Princip. 5 (1814).—Northern and alpine Europe and western Siberia; Greenland; eastern Arctic America, south to Port Burwell, Hudson Straits, northern tip of Labrador Peninsula (*Malte,*

nos. 120,142 and 120,177, both, as represented in the Gray Herbarium, a mixture of *V. alpina* vars. *typica* and *unalaschcensis*).

Var. *typica* (PL. 563, FIGS. 1 and 2), is ordinarily quite distinct in its glabrous capsule and the glabrous backs of the sepals; also in the usually non-ciliate upper leaves. The last character breaks and it is not difficult to find plants of Labrador and New England, otherwise good var. *unalaschcensis*, with essentially glabrous backs to the sepals (PL. 564, FIGS. 3 and 4). Although Pennell restricts typical *V. alpina* in Europe to "Scandinavia and the Highlands of Scotland," Devold & Scholander (l. c. 83) state that it is found south to the Swiss Alps. Pennell assigns typical *V. alpina* "Sepals . . . apparently little shorter than the corolla." This is, of course, a relative character; but several modern specimens before me show. the corolla fully twice as long as the calyx (PL. 563, FIG. 1) and it is so shown in many illustrations. It cannot, therefore, be maintained as a constant character, that the sepals are only a little shorter than the corolla. Although var. *typica* is ordinarily characterized by its strictly glabrous capsule, there are in the Gray Herbarium several collections from Labrador and New Hampshire (PL. 564, FIGS. 3 and 4) with the nearly glabrous sepals almost of var. *typica* but with the capsules bearing some of the septate trichomes which, theoretically, should never be found on plants with glabrous-backed sepals; consequently, when it is maintained that the polymorphic North American series which Pennell and, following him, Devold & Scholander, call a species, *V. Wormskjoldi*, is specifically separated from *V. alpina*, var. *typica* because it has pubescent capsules and pubescent backs of the sepals, it must be admitted that the pubescence varies from dense and abundant to very sparse or almost negligible (PL. 564, FIGS. 2–4).

Var. UNALASCHCENSIS Cham. & Schlecht. in Linnaea, ii. 556 (1827); Robinson & Fernald in Gray, Man, ed. 7: 728 (1908). *V. Wormskjoldi* Roemer & Schultes, Syst. i. 101 (1817); Pennell in RHODORA, xxiii. 15 (1921), as *Wormskjoldii;* Devold & Scholander, l. c. 84, figs. 16 (right) and 18 (1933); Hultén, Fl. Aleut. Isl. 291 (1937). *V. villosa* Wormskj. ex Roemer & Schultes, l. c. as syn. (1817). *V. alpina*, var. *Wormskioldii* (Roem. & Sch.) Hook. Bot. Mag. lvii. t. 2975, as to source of name (1830). *V. nutans* Bong. in Mém. Acad. Petersb. ii. 157 (1833). *V. alpina*, var. *villosa* (Wormskj.) Lange, Consp. Fl. Groenl. 261 (1887), name taken from "v. v i l l o s a Wormskj. mscr." *V. Wormskjoldi nutans* (Bong.) Pennell in RHODORA, xxiii. 15 (1921).—Greenland and Arctic America, south to subalpine meadows, wet rocks and moss and brook-sides of Shickshock Mts., Gaspé Co., Quebec, Mt.

Katahdin, Maine and White Mts., New Hampshire; along the higher Rocky Mts. to Colorado (3050–3500 m.); Pyrenees.

Var. *unalaschcensis* (PL. 564), apparently not differing from var. *villosa* (*V. Wormskjoldi*), has, as already noted, been stretched to cover nearly all North American plants of the *V. alpina* affinity. In its restricted sense it is the most northern of the series with regularly pubescent capsules, although in subalpine to alpine situations it extends southward to Gaspé, northern New England and Colorado. Much emphasis has been placed by recent authors (Pennell, Devold & Scholander, Hultén) upon the gland-tipped trichomes of its capsule and calyx, as opposed to the nonglandular trichomes of *V. alpina*, var. *australis* Wahlenb. (1814) or var. *lasiocarpa* Hartm. (1832) (*V. pumila* Allioni) of Europe (PL. 563, FIGS. 3 and 4). There is a not always perfectly clear difference in the hairs; whether they are actually gland-tipped in var. *unalaschcensis* I have not fully convinced myself. Like the trichomes of var. *australis* they are septate and moniliform. In var. *australis* (or var. *lasiocarpa*) (PL. 563, FIG. 4) the cells are elongate and the terminal one prolonged and without conspicuous dark content. In var. *unalaschcensis* the cells are shorter and the terminal cell, after the shrinking of the trichome in drying, shows as an ovoid to subglobose short tip, sometimes with dark content. Since they have very regularly been called gland-tipped hairs we will so call them.

Pennell (RHODORA, xxiii. 14, 15) allows the European plant capsules and sepals only with "pubescence with glandless hairs" and a height of "usually .5–1 dm.," while his *V. Wormskjoldi* has the "hairs with rounded glandular tips" and a height of "usually 1.5–3 dm." In view of Pennell's inclusion under his "*V. Wormksjoldii*" of five quite different and mostly isolated North American plants (one with stems up to 4 dm. high, two with them down to 0.5 dm., one with dense subcapitate fruiting racemes sometimes only 1 cm. in length, another with the loose and remotely fruited racemes up to 1.5 dm. long) which differ from one another as much as do *V. Wormskjoldi* and *V. pumila*, it is worth noting that the gladular hairs usually ascribed only to var. *unalaschcensis* (*V. Wormskjoldi*) may occur, likewise, in the European var. *australis* or *lasiocarpa* (*V. pumila*). Devold & Scholander quote Coste, in his Flore de la France, who described the plant of the Pyrenees, the Jura, the Alps, the Auvergne and Corsica: "Plante vivace de 5–15 cm., poilue-glanduleuse dans de haut, . . . celle-ci

[capsule] bien plus long que le calice poilue-glanduleuse." They characterize Coste's description as "due to a mistake," though they go on: "But it is not impossible that it is based on some glandular specimens of *V. Wormskjoldii* from Europe, so much the more as we have seen two specimens from the Pyrenées which are densely glandular pubescent, and which, accordingly, cannot with certainty be distinguished from *V. Wormskjoldii*."

Discussing true *V. alpina* (which they do not recognize as occurring in America, except in Greenland) and the European *V. pumila* (*V. alpina*, var. *australis* or *lasiocarpa*), the last quoted authors state that "The quite extensive material Scholander has seen from Scandinavia and Central Europe has absolutely convinced him that these two species are distinct. He has never seen intermediate forms and the geographical distribution is likewise convincing." Even though *V. alpina* and *V. pumila* may not be demonstrated to pass directly from one to the other it is important to remember that the glabrous-backed sepals of the former are sometimes too closely approached in plants of eastern North America which are otherwise good *V. Wormskjoldi*. Furthermore, when the late Dr. M. O. Malte got *V. alpina* at Port Burwell (southern entrance to Hudson Strait) he twice collected it mixed with var. *unalaschcensis* (*V. Wormskjoldi*), apparently without noting them as distinct species or even as varieties. These two grow together in eastern North America; and several collection from Greenland show them mixed. If, in the Pyrenees, the home of the "distinct" *V. pumila*, some specimens "are densely glandular pubescent, and . . . , accordingly, cannot with certainty be distinguished from *V. Wormskjoldii*," we have little in the way of *absolute* specific and phytogeographic difference left. The repeated assertion that *V. Wormskjoldi* is a species because it "may reach a height of 30 cm." does not prove it a species; plenty of American plants with the characters of *V. Wormskjoldi* may be as small as *V. pumila*. If the latter in the Pyrenees may be so glandular that it cannot be separated from the former it seems to me that the two are not specifically distinct. PLATE 563, FIGS. 3 and 4 show *V. pumila* from southern Europe; PL. 564, FIGS. 1 and 2 show dwarf *V. Wormskjoldi* from Labrador. As "distinct" species they make a weak display; species, like ambition, "should be made of sterner stuff."

Although maintaining *Veronica Wormskjoldi* as a species, Hultén (p. 292) discreetly says: "In the Scandinavian material of *V. alpina*